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TROPICAL DISEASES BULLETIN

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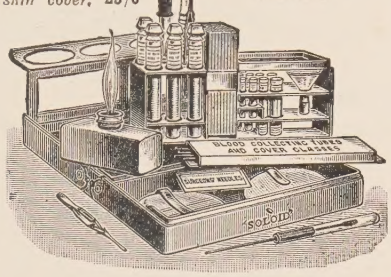

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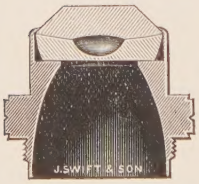

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TROPICAL DISEASES BUREAU.

TROPICAL DISEASES BULLETIN.

Vol. 3.] 1914. [No. 1.

RELAPSING FEVER.

North Africa.

Conseil (E.). **La Fièvre Récurrente Nord-Africaine. (Etude Clinique sur Cent Soixante Cas.)**—*Arch. Inst. Pasteur Tunis.* 1913. No. 1/2. pp. 37-66.

During the epidemics of 1912 and 1913 in Tunis, the author had the opportunity of observing numerous cases of relapsing fever and has collected notes on the clinical features of the disease. The incubation period varies from two to eight days, being usually about five to six. The disease begins suddenly without any prodromal symptoms. The initial symptoms are merely those of all acute febrile diseases and closely resemble those of influenza. After the first attack, which generally lasts from five to nine days, there is an apyretic period of five to fifteen days (average—seven to nine days) followed by a relapse, which may present all gradations from a mere slight elevation in temperature up to an attack lasting some days and equalling the initial one in the severity of the symptoms. Almost invariably after one, two, or three typical relapses, one notes slight rises in temperature of one to two days' duration unaccompanied by any other symptoms, and similar abortive relapses may be observed in patients that have been treated with salvarsan, etc. The number of typical febrile attacks is somewhat variable, but of 108 untreated cases seventeen had only one attack; 79, two attacks; nine, three attacks; whilst three patients had four attacks. The disease thus differs from tick-fever, in which there are usually several relapses, and resembles more closely European relapsing fever.

Briefly, the average course of the disease is two attacks of five to six days each, separated by an apyretic period of about ten days. Often during the apyretic period a subfebrile condition may be noticed, the patient showing little accesses of fever resembling those of malaria.

The most characteristic symptoms, in addition to the fever and the presence of spirochaetes in the blood, are the hypertrophy of the liver and spleen, combined with the fact that

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these organs are painful on pressure. The very high temperature and rapid pulse are generally combined with a good general state, without delirium or prostration, and with the preservation of all the intellectual faculties. Occasionally however, though rarely, the patient is prostrated by the infection and presents nervous symptoms resembling those of typhoid.

Jaundice is present in a considerable number of the cases (53 out of 160), but is never accompanied by retention of bile.

When the liver is seriously affected a so-called bilious type of the disease may be produced and this form is the most dangerous. Death was observed in six out of 160 cases, and five of these fatal cases succumbed to the bilious type.

E. Hindle.

Nicolle (Ch.), Blaizot (L.), & Conseil (E.). **L'Epidémie Tunisienne de 1912 et la Demonstration expérimentale de la Transmission de la Fièvre Récurrente par les Poux.**—*Arch. Inst. Pasteur Tunis.* 1913. No. 1/2. pp. 1-30.

The first part of the paper is concerned with a description of the epidemic of relapsing fever that broke out in Tunis during the year 1912. From the evidence produced it seems most probable that the disease was introduced from Tripoli, by natives of that country who came to work in the mines. The outbreak of relapsing fever corresponded with a considerable epidemic of typhus, which is easily explicable as both are transmitted by lice.

Although it is not stated, the remainder of the article is merely a reprint of that previously published by the authors in the *Annales de l'Institut Pasteur* (see this *Bulletin*, Vol. 2, p. 143).

E. H.

Sergent (Edm.). **Infection de Fièvre Récurrente par les Muqueuses chez l'Homme.**—*Compt. Rend. Soc. Biol.* 1913. Aug. 1. Vol. 75. No. 28. p. 185.

Although in 1909 Nattan-Larrier showed that the spirochaete of relapsing fever could pass through sound mucous membranes, in view of the theory of Nicolle, Blaizot and Conseil regarding the louse transmission of this disease, the following observation is of some interest.

Three persons were assisting at the injection of a monkey with blood containing spirochaetes (Algerian strain). As the result of a movement of the monkey the blood squirted out of the syringe and fell on the forehead and eyes of all three persons. Two of these wore neither eye-glasses nor spectacles and some of the blood fell into their eyes; eight days later both developed an attack of relapsing fever which was cured by injections of salvarsan. The third person wore spectacles which prevented the infected blood entering his eyes, and he remained in good health. It seems, therefore, that the first two persons had been inoculated through the mucous membranes of the eyes, whilst the latter had been protected by his spectacles.

E. H.

CONSEIL (E.). **Chimiothérapie de la Fièvre Récurrente.**—*Arch. Inst. Pasteur Tunis.* 1913. No. 1/2. pp. 67-87.

The author has employed a variety of compounds in the treatment of the relapsing fever of North Africa and gives a detailed account of his results. Eleven cases were treated with intravenous injections of salvarsan (dose = 0·008 gm. per kilo body weight), and ten of these were cured as a result of one injection. In one case, however, the patient relapsed, but the severity of the symptoms seemed to be diminished. In every instance the injection of the drug was followed by a very violent reaction, the patient being completely prostrated for a period of from 5 to 20 hours, after which the symptoms disappeared and the patient rapidly recovered.

Eleven cases were treated with intravenous injections of neosalvarsan (dose = 0·021 to 0·007 gm. per kilo.). No accident occurred and all the patients were cured as a result of one injection. The administration of the drug was followed by a general reaction one or two hours later, but this reaction was less severe than that following the injection of salvarsan.

Hectine (sodium para-amino-phenyl-arsenate) was employed in seven cases, being administered intramuscularly in doses of 0·2 to 0·4 gm. repeated daily for 6 to 20 days. The results were uncertain for, although relapses were prevented in four cases, in the remaining three the disease followed its normal course.

Galyl and Ludyl (two arsenical compounds prepared by MOUNEYRAT) were found to have a prompt curative action in eight cases. Both compounds are strongly recommended by the author, as they can be employed more easily than neosalvarsan and seem to be equally efficacious.

In addition, injections of potassium antimonyl tartrate and aniline antimonyl tartrate were employed. The first compound was used for eight patients, doses of 0·1 gm. being injected daily, and in four cases relapses were prevented. The other compound was used for five patients, and in only one case was it successful in curing the disease and preventing relapses. These antimony preparations, therefore, are of little use in the treatment of relapsing fever, the most effective compounds being neosalvarsan, galyl, and ludyl.

E. H.

TROPICAL AFRICA.

RODHAIN (J.), PONS (C.), VANDENBRANDEN (F.), & BEQUAERT (J.). **Rapport sur les Travaux de la Mission Scientifique du Katanga (Octobre 1910 à Septembre 1912).** (Chap. 1. pp. 7-27. Observations concernant la Fièvre Récurrente Africaine.)—1913. Brussels: Hayez, Imprimeur de l'Académie Royale. [Royaume de Belgique—Ministère des Colonies.]

The authors give a short account of the distribution of *Ornithodorus moubata* accompanied by a map, on which are marked new localities in the Katanga district at which ticks were found by members of this expedition.

Then follows a description of thirteen cases of "Tick Fever" (*S. duttoni*) occurring in natives. In all cases the cerebro-spinal

fluid was examined but, although alterations in the composition of the fluid were noticed, spirochaetes could never be detected, either by microscopical examination, or by injecting monkeys with the liquid.

The authors' conclusions are as follows:—

(1) In more than 50 per cent. of the cases the development of *Spirochaeta duttoni* in the negro is accompanied by an alteration of the cerebro-spinal fluid, consisting in a mononucleosis with augmentation in the total amount of albumins.

(2) This meningeal reaction, of varying intensity, may or may not be accompanied by symptoms of persistent cephalalgia and contraction of the pupil lasting for some time after the febrile periods and in the absence of visible spirochaetes in the blood.

(3) Neither microscopical examinations, nor the inoculation of the altered fluid into susceptible monkeys have enabled us to decide whether the meningeal reaction is caused by the penetration of spirochaetes into the cerebro-spinal fluid. One may admit that the multiplication of these micro-organisms is very ephemeral or perhaps localized in this region; in any case their active multiplication seems to constitute a great exception.

(4) In the single case in which several successive lumbar punctures could be practised, the cytological and chemical alterations of the cerebro-spinal fluid, which existed eighteen days after the first appearance of spirochaetes in the blood, had disappeared fifty-seven days after the commencement of the infection, at the same time as the patient developed symptoms of a severe ocular lesion.

Finally the authors add notes on the treatment of "Tick Fever" by intravenous injections of salvarsan. Most of their results were published in the *Annales de l'Institut Pasteur* (Vol. 25, p. 539), and these observations are reproduced together with two fresh cases, making a total of eleven. The curative dose was found to be 0·01 gm. per kilogram of the body weight of the patient, injected intravenously. In doses of 0·005 to 0·008 gm. per kilo. of the body weight the spirochaetes disappeared from the blood, but relapses were not prevented.

E. H.

Blanchard (M.). **Epidémie de Spirochétose humaine à Bikié (Congo français).**—*Bull. Soc. Path. Exot.* 1913. Oct. Vol. 6. No. 8. pp. 559-560.

In April and May, 1913, Dr. Morachini observed numerous cases of fever among both Europeans and natives at the station of Bikié, French Congo. Preparations of the blood of these patients were sent to Blanchard, who found spirochaetes in them and thus confirmed Dr. Morachini's suspicion that the disease was "Tick fever."

[This is the first record of African Relapsing Fever occurring in French Congo.]

E. H.

Drake-Brockman (R. E.). **On the Occurrence of an Epidemic of Relapsing Fever in Bulhar, British Somaliland.**—*Jl. London School Trop. Med.* 1913. Nov. Vol. 2. Pt. 3. pp. 195-199. With 2 charts.

The author gives some particulars of an outbreak of relapsing fever at Bulhar, a coast town of British Somaliland. The disease

was restricted to two haffas,* one occupied by a race of outcasts (Midgans) and the other by a somewhat destitute tribe of Somalis. In the former haffa there were 46 huts with 106 inhabitants and of these, in April, no fewer than 38 had had the fever and 17 were then down with it. In the adjoining haffa, out of 152 inhabitants 6 had recovered while 8 were still infected. The following ticks were found in and about the huts of the infected:—*Hyalomma aegyptium*, *Rhipicephalus pulchellus*, *R. simus*, *R. sanguineus*, *Boophilus* sp., *Ornithodorus savignyi* and *Argas persicus*. *O. savignyi* was found almost entirely in the soft soil or sand covering the floor of the huts or immediately outside them. The Somalis have a special name for this tick (Kudkudeh), which is common in all the coast towns, and say that the bite sets up great irritation. *Argas persicus*, on the other hand, is said not to attack man in this region.

With regard to the disease, charts are given of the temperature in two cases. The spirochaetes in every case were only found during the initial attack and not in any of the relapses. The parasite appears to be identical with *S. duttoni* and the author is of the opinion that the disease has been recently imported from British East Africa. During the past few years a colony of Somali traders has been established in Nairobi and therefore the natives are continually arriving from that region. The natives say that the disease has only recently appeared in this region though they have known the ticks from their childhood. The symptoms seem to be of the usual African type, the disease relapsing after successive intervals of one, two and three weeks.

There was apparently no difference between the symptoms of the initial attack and the relapses. The main symptoms were severe headache with giddiness, vomiting and profuse sweating. Constipation was marked in both cases. In one case there was photophobia, conjunctivitis and iritis after the first attack, whilst in two others there was bronchitis.

E. H.

LAMOUREUX (A.). **La Fièvre Récurrente de Madagascar. Considérations Cliniques. Le Spirochète dans l'Organisme Humain. Essai de Traitement par le '606.'**—*Bull. Soc. Path. Exot.* 1913. July. Vol. 6. No. 7. pp. 523-533. With 7 curves.

The author gives further details of twenty-five cases of relapsing fever observed at the military hospital of Majunga on the West Coast of Madagascar (see this *Bulletin*, Vol. 1, p. 625). The infection is transmitted by *Ornithodorus moubata* and the clinical symptoms of the disease closely resemble those of African relapsing fever (*S. duttoni*). According to the patients the incubation period varies from 6 to 15 days. The first attack generally lasts about three or four days and is accompanied by a temperature of 38° to 40° C. The symptoms are very inconstant, but headache, prostration and gastro-intestinal disturbances with constipation are usually present. In three-quarters of the

* A "haffa" is a collection of huts forming an irregular town block, all occupied by members of the same tribe.

cases the first attack was followed by one or more relapses occurring at intervals varying from three to nine days; in exceptional cases the intervals were respectively two and eleven, twelve and fifteen days. The symptoms were generally less intense during the relapses than in the first attack.

The spirochaetes were generally very rare in the blood and could seldom be found after the first attack. Occasionally, however, as many as five and six parasites were present in each microscopic field. The spirochaetes belong to two types, the first of which are long (20-40 μ) and fine, with numerous spirals, whilst the second are short (8-15 μ) and thick, with few spirals, and are often irregular and twisted. The latter forms are the more numerous.

The fever seems to be very benign and there were no fatal cases; but all the patients were adults and the author was unable to determine whether or not they possessed any immunity against the disease as a result of possible previous infections. The recurrent character of the fever is not constant, for occasionally cases of spirochaetal infection were observed with only a single attack.

Fowler's solution, arrhenal, sodium cacodylate and quinine were found to be without action on the disease. Salvarsan administered intravenously in single doses of 0·3 gm. was very inconstant in its action. It did not prevent relapses and moreover when administered during the first attack did not always cause the disappearance of the spirochaetes.

E. H.

CHALMERS (Albert J.) & O'FARRELL (W. R.). **Bronchial Spirochaetosis.**—*Jl. Trop. Med. & Hyg.* 1913. Nov. 1. Vol. 16. No. 21. pp. 329-334. With 3 figs.

The authors describe cases of bronchial spirochaetosis observed in the Anglo-Egyptian Sudan, the first time that it has been recorded from this locality. The disease seems to be fairly common in Khartoum, for ten cases were met with in a period of only two months. In all the patients large numbers of spirochaetes were found in the sputum, and relatively but few bacteria and no other organisms such as fungi. The parasite seems identical with that observed by CASTELLANI in the sputum of similar cases in Ceylon, and named by him *Spiroschaudinnia bronchialis*.

The authors then proceed to shew that the spirochaete must be the cause of the bronchitis. The parasite is morphologically distinct from that occurring in the mouth and throat (*S. dentium*, etc.) of a large proportion of normal persons; therefore the disease is not caused by an increase in the number of these mouth or throat spirochaetes and their invasion of the bronchi. These forms occasionally invade the bronchi but can be readily distinguished from *S. bronchialis*. Moreover, an experiment is described in which a monkey, that had a small number of fine spirochaetes at the top of its larynx [probably a variety of *S. dentium*], was caused to develop a bronchopneumonia by exposing it to a severe chill. The monkey died and on post-mortem numerous pneumococci and a few of the laryngeal spirochaetes were found; the latter were identical with those found

before infection. *S. bronchialis* was found to be always present in abundance during attacks of bronchial spirochaetosis, to diminish during convalescence, and subsequently to disappear or become extremely rare. A monkey that was injected intratracheally with sputum from a case of bronchial spirochaetosis and subsequently chilled, developed a temperature of 106·3° the same night, had a peculiar kind of cough and showed a quantity of mucus hanging down from its muzzle. The mucus of the throat was found to be full of *S. bronchialis*. In a couple of days the monkey became very much better and the spirochaetes disappeared.

In addition two members of the laboratory became infected under conditions that seem to exclude any other source of infection than contact with the cases in the laboratory. Both shewed the presence of *S. bronchialis* in the sputum and one was treated with arsenic, when the symptoms promptly disappeared.

The authors then discuss the symptomatology of the disease and its complications, including the pneumococcus, the tubercle bacillus, and a fusiform bacillus. The diagnosis of the infection can only be made by examining the sputum and finding the spirochaete. The disease is very mild and is readily amenable to treatment. It seems to be spread by the agency of human carriers, and secondary causes such as chills are of great importance.

E. H.

India.

Steen (R.) & Townsend (R. S.). **Relapsing Fever in Bulandshahr District, U.P., 1912-1913.**—*Indian Med. Gaz.* 1913. Sept. Vol. 48. No. 9. pp. 338-341. With 6 temperature charts.

Relapsing fever has been present in epidemic form during the past eighteen months in several districts in the North-West of the United Provinces, being most prevalent in Muzaffarnagar, Meerut and Bulandshahr. According to notes left by previous Civil Surgeons in the latter district, there occurred in 1908 three cases of relapsing fever in the Jail and two in the Police Hospital; in 1909, five cases in Jail and two in Police Hospital; in 1910 nil; in 1911 three in Police Hospital; in 1912 nil. As routine blood examination was practised in these hospitals it is difficult to believe that the disease was at all widespread in this district during these years. During April, May and June, 1912, three severe outbreaks of fever with high mortality were reported, and subsequently further outbreaks in September, October and November. The examination of the blood of patients revealed the presence of spirochaetes morphologically indistinguishable from *S. recurrentis*. The disease has been proved to exist in 65 villages, so is evidently very widespread.

The predisposing causes are said to be undoubtedly dirt, poverty and insanitary surroundings, for nearly all the cases occurred amongst the lower castes of the people. The body-louse was often found on infected persons while bed bugs were frequently absent, and the authors describe cases, showing the very infectious nature of the disease, which are easily explicable now that its mode of transmission by the body-louse is known.

From various observations the incubation period seems to be from four to eight days. The onset is usually sudden, the temperature runs up to 103°-104° and there are all the usual symptoms accompanying high fever during the next day or two. Prostration is usually extreme from the onset, and delirium, sometimes very violent. Headache is sometimes severe, but pains in other parts of the body are more frequent.

The first attack may last from five to ten days, the average being about eight. The fall occurs nearly always by crisis, frequently accompanied by great collapse; death often occurs at this period.

The interval between the first and second attacks varies from five to fourteen days, the average being eight to ten days, and its duration is generally about five or six days. Occasionally yet another attack develops but as a general rule there is only one relapse. Out of 140 cases twenty (14 per cent.) had no relapse, 113 (81 per cent.) had one relapse, and seven (5 per cent.) had two relapses.

The clinical symptoms do not call for any special remark, but it may be noted that parotitis was present in 7 per cent. of the cases and was a very serious complication. Pneumonia was also another serious complication and when present generally developed towards the end of the first attack.

The mortality in the epidemic varied greatly in different places and also in different outbreaks. In the earlier cases it was often as high as 75 to 80 per cent. but subsequently became considerably lower. Careful collection of information from all parts of the district gave a total of 744 cases with 197 deaths (= 26·5 per cent.). In another series of figures (140 cases) the mortality was 54·3 per cent., but the authors state that 30 per cent. seems to be the usual mortality.

The authors did not employ salvarsan or any other drugs in the treatment of the disease, but from the results obtained in other regions there is little doubt that these compounds would be effective in the treatment of this variety of relapsing fever.

[The high mortality during epidemics of relapsing fever in both India and China is worthy of notice, for many observers have recorded outbreaks with mortalities as high as 60 to 70 per cent. Nevertheless the spirochaete causing the disease in these districts seems to be morphologically identical with that of the European and North African relapsing fevers (*S. recurrentis*) in which the mortality rarely, if ever, exceeds 5 per cent.]

E. H.

Smith (C. H.) & Graham (G. F.). **Relapsing Fever in Chitral with an Account of Successful Animal Inoculations.**—*Indian Med. Gaz.* 1913. Oct. Vol. 48. No. 10. pp. 381-382. With 4 charts.

The authors describe eleven cases of Indian relapsing fever, occurring in Chitral in the late winter and spring of 1913, which seem to illustrate two types of the fever. The outbreak first appeared among some remote Kaffir villages on the Afghan

frontier situated at about seven thousand feet elevation. According to the villagers this seemed to be a disease which was previously unknown among them. The cases are divided into two groups. (1) Two cases occurring in Punjabis and commencing about ten days after they returned from these Kaffir villages. In both patients there was a continuous fever lasting for several days and in one case there was a relapse. Blood examination showed the presence of numerous spirochaetes of rather a small type. (2) Nine cases occurring among Gurkhas and Pathan sappers of the Chitral garrison, three of which showed no relapse; four, one relapse; and individual cases two and three respectively. The incubation period seemed to be about ten or eleven days. Compared with the first two cases the general condition of the patients was much less grave, but the relapses prolonged the duration of the infection. The spirochaetes, which were present in the blood of all nine patients, are said to be larger than those present in the first two cases and were comparatively rare in the peripheral circulation. The type of fever present in these latter nine cases is said to resemble that of Quetta relapsing fever described by Browse (see this *Bulletin*, Vol. 1, p. 386).

Three rats received a subcutaneous injection of 1 cc. of blood taken from the vein of one of the second group of cases during a relapse. Each of the rats became infected after an incubation period of three to four days; spirochaetes were present in the blood for two or three days, after which they disappeared and were not found again. A subinoculation from one of these into another rat gave positive results, the animal becoming infected after an incubation period of three days.

The paper is accompanied by four charts, illustrating the two cases of type 1 and two of type 2.

[The distinction between the authors' two types seems to be very uncertain, for the type of fever is liable to considerable variation in different individuals and also races. It is unfortunate that measurements are not given of any of the spirochaetes, for differences in length between the two types would easily be recognised by measuring a sufficiently large number of individuals (say fifty) and taking the average. The ease with which the authors have succeeded in making subinoculations into rats and the length of time the parasites persisted in the infected animals seems to differentiate this spirochaete from *S. recurrentis*.]

E. H.

Humphry (A. D.). **Relapsing Fever in the Darjeeling District.** [Correspondence.]—*Indian Med. Gaz.* 1913. Nov. Vol. 48. No. 11. p. 451.

The author records an outbreak of relapsing fever at Margaret's Hope Tea Estate at an elevation of 5,000 feet at the end of May, 1913. The outbreak was traced to the wife of a tea-maker who arrived ill direct from Nepaul.

The total number of cases was 25, of which 15 recovered and 10 died; four cases relapsed once and two cases twice. The main symptoms were fever beginning in the evening, pain in the back

and limbs, followed by vomiting, diarrhoea and slight jaundice. The duration of the fever was about six to eight days and its remission was accompanied by profuse sweating.

These cases occurred in 5 houses that were close together, but each surrounded by a clear air-space. In all the patients spirochaetes could be easily found by examining stained preparations, in one slide there being as many as 10 parasites to the field.

E. H.

Indo-China and China.

Mouzels (P.). **La Fièvre Récurrente au Tonkin et plus particulièrement à Hanoï pendant les Epidémies de 1911 et 1912.**— *Ann. d'Hyg. et Méd. Colon.* 1913. Apr.-May-June. Vol. 16. No. 2. pp. 249-282.

The first case of relapsing fever recognised in Tonkin was observed by Séguin in 1907. Since this time numerous other reports have appeared and the prevalence and high mortality of the Chinese relapsing fever is shown in the following table of the cases occurring in Tonkin :—

Year.	Number of Cases.	Number of Deaths.	Mortality.
1908	2,300	625	27·17 per cent.
1909	1,581	627	39·65 ,,
1910	315	95	30·15 ,,
1911	840	350	41·66 ,,

The author was able to observe the greater number of the cases treated in the native hospital of Hanoï during the years 1907 to 1910, and since 1911 has made a detailed study of another 117 cases. The present account is especially concerned with the latter and comprises a description of the clinical symptoms of relapsing fever, its treatment and, finally, its epidemiology and prophylactic measures.

The symptoms do not call for any special remark, as they have been previously described. A single attack was noticed in 20·83 per cent.; two in 59·72 per cent.; three in 16·68 per cent.; and four attacks in 2·77 per cent. of the cases.

The spirochaete is morphologically indistinguishable from *S. recurrentis*. It is generally present in the blood during the first attack, disappears during the apyretic intervals and reappears when the temperature rises again. The plasma of the blood seems to be modified, for the author noticed that the coagulability of the blood is considerably retarded and in certain patients there is a great tendency to haemorrhages, especially of the nose and intestine.

With regard to the etiology of the disease the author discusses the possibility of various modes of infection and concludes that ectoparasites must be responsible for the transmission. Lice,

bugs, fleas and mosquitoes are all found capable of carrying the virus, but lice, fleas and mosquitoes are considered the most important.

An epidemic occurred in the house of a well-to-do native, where the only insects present were fleas and mosquitoes. Lice and bugs were quite absent and yet five persons out of the seven occupants of the house became infected. Living spirochaetes were found in the stomach of a *Culex* two hours after its capture in the hospital; moreover the spirochaete remained virulent for five days in the stomach of the bug and six days in the louse; therefore all these insects may serve as carriers. The author is of the opinion that the disease may be transmitted by any blood-sucking insect. In this connection the seasonal prevalence of the infection is most interesting, as practically all the cases occur in the first six months of the year. This is well shown in the following table of the cases in the hospital at Hanoï:—

Month.	1907.	1908.	1909.	1910.	1911.	Total each month.
January	0	1	0	6	1	8
February	1	3	2	5	4	15
March	4	10	5	13	28	60
April	12	15	10	16	38	91
May	16	27	9	9	24	85
June	5	15	6	7	18	51
July	1	3	2	1	3	10
August	2	1	0	2	0	5
September	0	2	2	0	0	4
October	0	1	0	0	1	2
November	0	0	0	0	0	0
December	0	1	1	0	0	2

In Tonkin the hottest season of the year is about April; on the approach of the cold weather of August the disease rapidly disappears. [This seasonal variation agrees with the view that Culex is the main carrier of the infection, but is opposed to the view that lice are responsible, for in this case the disease should be especially prevalent during the colder months of the year.]

As prophylactic measures the author advocates the isolation of patients, the destruction of all blood-sucking insects and the protection of healthy persons against any risk of infection.

With regard to treatment the use of intravenous injections of salvarsan is found to cure the disease rapidly, and in addition the period of convalescence is very much shortened. Its use in hospital is therefore an economy, as the patients are able to leave after an average duration in hospital of only 12 days, instead of 30 days which was the usual period prior to the introduction of salvarsan.

E. H.

TAYLOR (H. B.). **Relapsing Fever. The Relation of Rise and Defervescence of Temperature to the Appearance and Disappearance of Spirochaetae in the Peripheral Blood; with Notes on Treatment by Salvarsan.**—*China Med. Jl.* 1913. Sept. Vol. 27. No. 5. pp. 318-320.

The author remarks that further and closer observations are necessary to determine the usual time of the appearance of *Spirochaeta recurrentis* in the peripheral blood after the onset of fever, in both the original attack and the relapse. From his observations the author is of the opinion that in many cases the spirochaetes cannot be detected until the second or third day after the onset of fever.

Particulars are given of seven cases of relapsing fever that were treated by injections of salvarsan. Of two patients that had only received 0·2 gm. salvarsan, one showed a relapse of three days on the seventeenth day of the disease and the other two slight relapses at long intervals. When 0·3-0·4 gm. was given intravenously, no relapses were noticed.

E. H.

LOGAN (O. T.). **Relapsing Fever. The Relation of Rise and Defervescence of Temperature to the Appearance and Disappearance of Spirochaetae in the Peripheral Blood.**—*China Med. Jl.* 1913. Sept. Vol. 27. No. 5. pp. 321-324.

The author gives particulars of the number of spirochaetes present in the blood of relapsing fever patients, in order to call attention to the fact that the spirochaetes do not appear in the peripheral blood until some hours after the onset of fever and moreover disappear some hours before the temperature falls to the normal again.

E. H.

RUSSIA.

WINOCOUROFF (J.). **Rückfallfieber bei Kindern in Odessa. (Eigene Beobachtungen vom Jahre 1890-1910.)** [Relapsing Fever amongst Children in Odessa. (Observations during the years 1890-1910.)]—*Arch. f. Kinderheilkunde.* 1913. May 24. Vol. 60/61. pp. 777-789. With 8 curves.

During the twenty years from 1890-1910 the author has observed numerous cases of relapsing fever amongst children at the Jewish Hospital of Odessa. The disease seems to be much less fatal to children than adults, for out of 291 cases observed by the author there was only one death, whilst the general death rate of this disease is about 2 to 6 per cent. The main reasons that children do not succumb to the affection seem to be the healthy state of their heart muscles and the absence of alcoholic livers. Moreover, complications which are stated to occur frequently amongst adults are very rarely observed in children. Referring to the disease amongst babies the author remarks that it is extremely difficult to arrive at any definite conclusions with regard to its severity or otherwise, for as a general rule the attacks are probably not brought to the notice of physicians, the disease passing unnoticed by the parents.

The Indian Ink method of examining the blood is stated to be the simplest method of detecting the spirochaetes in the peripheral circulation.

In conclusion the author remarks that by improving the hygienic conditions of the poorer classes the disease would disappear from Odessa, in the same way that it has ceased to exist in Western Europe.

E. H.

SOPER (William B.). **A Case of Spirillum Infection.** — *Arch. Internal Med.* 1913. Sept. 15. Vol. 12. No. 3. pp. 273-275.

The author describes the history of a patient admitted to the Presbyterian Hospital, New York, apparently suffering from cholecystitis and pericarditis with effusion. Subsequently on four separate occasions fluid was aspirated from the chest and pericardium, and on two occasions was found to contain a few spirilla which were cultured anaerobically in NOGUCHI's medium for spirochaetes. Morphologically this spirillum is said to be made up of a number of segments lying end to end. These segments average 0·3 to 0·5 μ in width and 1 μ in length and the ends are rather abruptly blunt. The author remarks that this case, which ended fatally, seemed to be one of infection originating below the diaphragm and extending upwards. Nevertheless repeated cultures of the aspirated fluid were uniformly negative and the complete absence of any organisms, except the spirilla, make the supposition of a pure spirillum infection quite reasonable. The original pus and cultures were inoculated without effect into both rabbits and guinea-pigs.

[Unfortunately the author was unable to take a blood culture from the patient or to make an autopsy, and therefore the case is a little doubtful.]

E. H.

THE LIFE-HISTORY OF SPIROCHAETES.

MARCHOUX (E.) & COUVY (L.). **Argas et Spirochètes. Deuxième Partie. Le Virus chez l'Acarien.**—*Ann. Inst. Pasteur.* 1913. Aug. 25. Vol. 27. No. 8. pp. 620-643.

In the present memoir the authors continue their investigations on the biology of *S. gallinarum* (see this *Bulletin*, Vol. 2, pp. 365, 366) and demonstrate the presence of infective spirochaetes in the body of infected Argas. A Java sparrow inoculated with the triturated organs of two Argas became infected after an incubation period of eight days and succumbed to the disease, but another bird inoculated with the organs of three ticks never showed any signs of illness, but nevertheless was immunized against the disease. In another experiment the inoculations into sparrows of one salivary gland and one oviduct of a tick respectively, conferred immunity. This immunity was shown not to be the result of the presence of immune bodies in the organs of the tick, by inoculating birds with the filtered

extracts of the bodies of Argas, and also with the organs of ticks that had been heated to 55° C. in order to kill any living spirochaetes. In both cases no immunity was developed in the birds as proved by subsequent inoculations of virulent spirochaetes, and therefore the immunity must have been the result of the vaccination.

The authors then injected definite numbers of spirochaetes into Java sparrows and found that when injected subcutaneously 20,000 parasites infected a bird, 1,700 vaccinated it against subsequent infections without the infection developing, whilst 700 were without effect. Administered intravenously, 1,700 infected, 70 vaccinated, whilst 17 were without effect. In another experiment the developing embryos of fowls, whilst still in the egg, were injected with spirochaetes: 30 parasites were sufficient to produce a fatal infection in the embryo. These results were employed in order to estimate approximately the number of spirochaetes present in infected ticks.

With regard to the spirochaetes in the glands of the tick, the salivary and cephalic glands were carefully examined. Coxal glands were never discovered and the authors are of the opinion that the so-called coxal fluid excreted by Argas after a meal is merely the result of the rapid filtration of coelomic fluid through a thin sheet of chitin. [Robinson and Davidson have recently shewn that a coxal gland is present in Argas, but the gland is very inconspicuous and might easily be overlooked (see *Parasitology*, 1913, Vol. 6, pp. 250-252).]

In the salivary glands themselves spirochaetes were found very exceptionally, and then in very small numbers, but by isolating the salivary duct, crushing it on a slide, and staining with gentian violet considerable numbers of spirochaetes could be seen. After a meal spirochaetes appear in the acini of the salivary ducts but subsequently they disappear from this position, remaining only in the salivary duct where a single duct may contain as many as 900 parasites. The number of spirochaetes seems to be augmented after each meal, whether of infected or normal blood, and therefore the more often the ticks are fed, the more liable they become to transmit the infection.

The salivary fluid is thus infected and the authors observed infections produced in birds by the bites of Argas that certainly did not emit any coxal fluid or excrement whilst on the host.

The cephalic glands were constantly infected with spirochaetes, and as the secretion of these glands bathes the eggs when laid it is possible that this plays an important part in the transmission of the disease to the offspring. It was found by immersing freshly laid ova in blood containing spirochaetes that these parasites are capable of penetrating the chitinous layer surrounding the eggs; therefore it is quite conceivable that the eggs become infected by the entrance of spirochaetes contained in the secretion of the cephalic gland. On the examination of the eggs laid by infected Argas a very small proportion contained spirochaetes, but by making an emulsion of several eggs and centrifuging, two or three masses of agglutinated and extremely fine spirochaetes were obtained. The

injection of 20 eggs into a Java sparrow produced no infection but immunised the bird, and therefore these eggs probably contained more than 700 spirochaetes. In another experiment the contents of two eggs injected into the embryo of a fowl produced a fatal infection. Finally fourteen fowl embryos were injected each with the contents of single ova laid by infected Argas. Six of them, viz. 40 per cent., became infected; therefore each of these ova probably contained at least 30 spirochaetes. Nevertheless in most cases it was impossible to detect the parasites microscopically, and therefore one is compelled to assume that the thickness of the spirochaetes diminishes until they become so fine as to be ultra-microscopic, but that these forms are still virulent and capable of producing the infection when injected into susceptible animals.

E. H.

BALFOUR (Andrew). **A Contribution to the Life-History of Spirochaetes. A Reply to Dr. Gleitsmann.**—*Centralbl. f. Bakt.* 1. Abt., Orig. 1913. Aug. 4. Vol. 70. No. 3/4. pp. 182-185.

The author replies to GLEITSMANN's criticism of his work on the spirochaetosis of Sudanese fowls and more especially the hypothesis with regard to the nature of the so-called granules (see this *Bulletin*, Vol. I., pp. 622, 623). With regard to the cross-immunisation experiments the author points out that these are very uncertain, as NICOLLE and BLAIZOT have shown that in the case of the *recurrentis* group of spirochaetes a great deal depends on the age of the animal and still more on the dose of the virus. It is not considered necessary, as GLEITSMANN states, that in order to prove the granule theory one must assume either that the author was dealing with a special spirochaete strain, or a similar cycle must be demonstrated for all spirochaete strains. The question of racial peculiarity in the host organism, and the influence of local conditions should not be forgotten in this connection.

The "granule phase" is very common in Sudanese fowls, and in young chicks is even the rule, but it is not essential for the propagation of the virus. The granules shed by the spirochaetes are coloured faintly by Romanowsky stains, an observation which supports the idea of their spore nature.

The author describes an interesting experiment on the nature of the granules. A healthy chick was isolated and on November 15th was given 90 washed tick's eggs from several batches of *A. persicus*. These eggs contained numerous granules (=coccoid bodies), but none were found to contain spirochaetes. On November 23rd a few cell inclusions were found in the blood of the chicken and their numbers gradually increased until November 30th when the bird showed definite signs of illness. From December 1st to 6th the number of bodies decreased but on December 7th spirochaetes appeared in the blood; they disappeared the following day and were never found again. The chicken however remained in a somewhat marasmic condition and died on February 17th;

the intra-corpuscular bodies were present in its blood up to the time of its death.

Referring to the difficulties of work in the tropics the author mentions that he has recently found a spirochaete in the Malpighian tubule of a *Hyalomma aegyptium* which had fed only on the blood of healthy cattle. Finally it is pointed out that no toxin could produce the schizonts occurring in the Sudanese fowls infected with spirochaetosis. If these forms are not related to the spirochaete the only other explanation is that of a new blood parasite and a new disease closely associated with spirochaetosis probably because *A. persicus* is the carrier of both viruses.

[In order to avoid confusion it should be clearly understood that the term granule has been applied to at least three structures; (1) The spore-like bodies often liberated by spirochaetes; (2) The intra-corpuscular bodies first described by Balfour and supposed by him to develop from the above-mentioned spore-like bodies; and finally, (3) the coccoid bodies, or Leishman's granules, occurring in the cells of the tick or invertebrate host of the spirochaete. It would be simpler to restrict the term granule to (1), and apply the terms "intracorpuscular bodies" and "coccoid bodies" to (2) and (3) respectively. With regard to the nature of the intracorpuscular bodies, as Balfour agrees, the last word has not been spoken, but their appearance is such that they can hardly be the result of degeneration, as Gleitsmann supposes.]

E. H.

Gleitsmann. **Beitrag zur Entwicklungsgeschichte der Spirochäten (Borrelien). Ein Schlusswort zu Balfours Erwiderung.**—[The Life-History of Spirochaetes (Borrelia). A Concluding Note to Balfour's reply.]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1913. Aug. 4. Vol. 70. No. 3/4. pp. 186-187.

In this note the author repeats certain of his former statements and replies to some of Balfour's criticisms. With regard to the experiment described by Balfour (*see* above) Gleitsmann is of the opinion that the chicken was already infected with spirochaetosis when isolated and that the appearance of spirochaetes in its blood was merely the result of a relapse. The appearance of the spirochaetes for only one day tends to confirm this view.

E. H.

Laboratory.

Launoy (L.). **Le Fer du Sang chez la Poule normale et dans l'Infection par le *Spirochaeta gallinarum* Marchoux et Salimbeni.**—*Compt. Rend. Soc. Biol.* 1913. Oct. 24. Vol. 75. No. 29. pp. 248-249.

The author has estimated the amount of iron in the blood of nine normal fowls and finds that it only varies within very narrow limits, 0·042 to 0·047 gm. per 100 cc. of blood. He then estimated the amount of iron in the blood of four fowls five days

after they had been infected with fowl spirochaetosis. In every case the quantity of iron was on an average 25 per cent. less than in normal blood.

[STEPHENS and CHRISTOPHERS were the first to name *Spirochaeta gallinarum*: therefore Launoy is mistaken in attributing the name to MARCHOUX and SALIMBENI, who although they discovered the fowl spirochaete, never named it.]

E. H.

LAUNOY (L.) & LÉVY-BRUHL (M.). **Sur l'Anémie observée chez la Poule au Cours de l'Infection par le** *Spirochaeta gallinarum.*—*Compt. Rend. Soc. Biol.* 1913. Oct. 24. Vol. 75. No. 29. pp. 250-252.

The authors have studied the anaemia which is so well-marked in fowls that have been infected with fowl spirochaetosis. In their experiments they used a relatively attenuated virus, for the spirochaetes appeared in the blood of the fowl about 48 hours after inoculation and disappeared on the fifth or sixth day. The number of red cells was estimated by means of Malassez's haemocytometer and the following results obtained.

Fowl.	Before Infection.	After 2 days.	After 3 days.	After 5 days.	After 6 days.
1	2,740,000	2,135,000	1,950,000	1,800,000	—
2	2,881,200	2,435,000	2,250,000	1,340,000	—
3	2,520,000	,,	,,	1,445,000	1,460,000
4	2,920,000	,,	2,140,000	1,800,000	1,820,000
5	2,890,000	2,540,000	2,280,000	1,470,000	1,260,000

It is seen that the maximum anaemia is reached about the fifth day and after this crisis the number of red cells gradually increases, reaching the normal again in about twelve or thirteen days. On comparison with the diminution in the amount of iron in the blood, it is evident that the reduction in the number of corpuscles is proportionately greater, for in the former case it is only about 25 per cent. If one accepts the hypothesis that all the iron in the blood is fixed in the red cells, it is necessary to conclude that the individual value of the latter is augmented during the anaemia accompanying an attack of spirochaetosis. This observation shows that spirochaetal anaemia is closely related to the pernicious anaemias, the main difference being the quick recovery in the case of the former.

Morphological examination of the blood of infected fowls showed that polychromatophilia was present. Moreover the globular resistance of the cells was found to be slightly diminished (from 0·35 to 0·40).

E. H.

LAUNOY (L.) & LÉVY-BRUHL (M.). **L'Infection Spirillaire chez les Poules Ethyroïdées, Pouvoir Vaccinant de leur Sérum.**—*Compt. Rend. Soc. Biol.* 1913. Nov. 14. Vol. 75. No. 31. pp. 352-354.

The authors have removed the thyroid glands of five fowls and then injected them with *S. gallinarum* in order to determine whether this gland has any effect upon the course of the disease. The results shew that in adult fowls the thyroids do not play any essential part in the resistance of these animals to the infection, or in the rapidity and intensity of the formation of antibodies.

E. H.

HATA (S.). **A Contribution to our Knowledge of the Cultivation of** *Spirochaeta recurrens* [*recurrentis*]. — *Centralbl. f. Bakt.* 1. Abt., Orig. 1913. Nov. 26. Vol. 72. No. 1-2. pp. 107-112. With 1 fig.

In the endeavour to cultivate spirochaetes by NOGUCHI's method the difficulty of obtaining ascitic fluid, and moreover the variable nature of this liquid, have given rise to the necessity of finding some substitute which can be obtained at any time. The author finds that normal horse serum diluted with twice its volume of physiological saline and then heated forms a satisfactory substitute. Before being heated the mixture is poured off into test tubes and these are then placed in a water bath at 58° C. and the temperature gradually raised until it reaches 70° or 71° C. in three hours. The tubes are then heated at 71° C. for 30 minutes when the whole contents will present a translucent milky appearance with a semi-solid surface. After cooling, this mixture of semi-coagulated serum and saline can be substituted for Noguchi's ascitic fluid, with satisfactory results as far as the cultivation of *S. recurrentis* is concerned.

In addition, the author finds that the buff coagulum (the "buffy coat" composed of white corpuscles and platelets), which is produced during the clotting of the horse blood, can be substituted for the kidney of Noguchi's medium. One or two pieces of this coagulum about 1 cm. in diameter are put in each tube of semicoagulated serum and saline, and pushed down to the bottom by means of a sterile glass rod.

This culture medium is inoculated with a small quantity of blood containing the spirochaete and the cultures may be kept either at 37° C. or at room temperature. At 37° C. multiplication of the parasites is observed on the second day and reaches its maximum in 5-7 days and the spirochaetes may remain virulent for 21 days. The number is a little less than when kidney is used instead of coagulum, but on the other hand the spirochaetes are more virluent and show fewer degeneration forms. For subcultivation about 0·5 cc. of a 5-7 days' old culture is inoculated into a fresh tube and in this way the author has maintained *S. recurrentis* through 27 passages in 150 days and it still produces most vigorous cultures. Spirochaetes that have been cultivated at 37° C. for 4-5 days will live at room temperature for at least 60 days.

Finally, a further advantage of this medium, in addition to the uniform results obtained by its use, is the fact that prepared tubes can be kept for two weeks in a refrigerator without loss of efficacy.

[The results obtained by the author seem to be so very satisfactory that there is little doubt that the above-described medium will be a most useful substitute for Noguchi's medium, as the preparation of the latter involves numerous practical difficulties].

E. H.

HÜGEL (G.). **Experimentelle Beiträge zur chemotherapeutischen Wirkung von organischen Antimonpräparaten bei Spirochaeten- und Trypanosomenerkrankungen.** [Experimental Study of the chemotherapeutical Action of Organic Antimony Compounds on Spirochaetal and Trypanosome Infections.]—*Arch. f. Dermatol. u. Syphilis.* Orig. 1913. Sept. Vol. 118. No. 1. pp. 1-60.

The first part of this somewhat lengthy paper is devoted to a historical account of the subject extending back to the earliest times. The author then proceeds to give an account of his experiments with a large number of organic antimony compounds. In every case the effect was tried on fowls infected with *S. gallinarum*, and injections were made both at the same time as the fowl was inoculated with the spirochaetes and also after the parasites had appeared in its blood.

The results are somewhat disappointing, for only three compounds showed any indication of being of value as curative agents. These three compounds—the sodium salts of acetyl-p-aminophenylantimonate, benzolsulphono - p - aminophenylantimonate, and p-urethano-phenylantimonate, respectively—were also injected, with favourable results, into rabbits infected with syphilis, as the spirochaetes disappeared from the testes and most of the animals recovered.

The same three compounds were also used for the treatment of mice infected with dourine and nagana respectively. In most cases the length of life of the treated animal was increased and in one or two cases the animals were apparently cured, but there is no evidence of their having been kept under observation for a sufficintly long period to decide the latter point.

Finally, a few cases of human syphilis were treated by injections of the first and last of these compounds. The administration of the drugs was well borne in every case and after repeated injections the symptoms of the disease were found to disappear in the case of patients treated with the acetyl compound.

[From the author's results it seems doubtful whether organic antimony compounds are likely to be of much use in the treatment of spirochaetosis or trypanosomiasis. The paper contains an extraordinarily large number of printer's errors, the majority of the tables and many of the formulae being incorrect and somewhat misleading.]

E. H.

HAHN (BENNO) & KOSTENBADER. **Beitrag zur Erklärung der Wirkungsweise des Quecksilbers bei den Spirillosen.** [A Study of the Mode of Action of Mercury Salts on Spirochaetal Infections.]—*Berlin Klin. Wochenschr.* 1913. Nov. 24. Vol. 50. No. 47. pp. 2185-2186.

Employing an organic mercury compound (fluorescin-mercury), the authors have investigated its mode of action in spirochaetal infections, using as an example fowls infected with spirochaetosis. Their results show that in the case of fowl spirochaetosis, and also in human syphilis, extremely active mercury compounds have no direct action upon the spirochaetes either *in vitro*, or, in the case of *S. gallinarum*, within one hour after a curative dose of the drug has been injected into an infected fowl. Apparently, therefore, this compound has no parasitotropic action.

Employing another mercury salt, benzol-sulphonic acid azomercuric salicylate, the authors found that, when half the *dosis tolerata* was administered to infected fowls as soon as the spirochaetes appeared in the circulation, the parasites at once disappeared, whilst if greater doses were administered actually more spirochaetes appeared in the blood of these treated fowls than in the blood of untreated ones.

These results agree with MEYER's experience that in the treatment of syphilis the administration of massive doses of mercury salts is not as effective as that of smaller doses, whilst on the other hand the large doses have a very definite injurious action upon the body.

E. H.

FLOURENS. **Doses Limites auxquelles le Chlorhydrate d'Emétine et le Chlorhydrate de Quinine peuvent être employés chez le Calfat.** —*Bull. Soc. Path. Exot.* 1913. Nov. Vol. 6. No. 9. pp. 642-644.

The author has tried the effects of treating infections of *S. gallinarum* in the Java sparrow (*Padda orizivora*) by means of chlorhydrate of emetine and chlorhydrate of quinine respectively. Neither compound was found to be of any use in the treatment of either this infection or fowl pest, but in the case of the former the course of the disease was frequently prolonged. It was found that these birds can withstand doses of 0·015 gm. of the emetine compound and 0·125 gm. of the quinine salt, in both cases the dose being calculated for a kilogram of body weight.

E. H.

SLEEPING SICKNESS.

NYASALAND PROTECTORATE. **Sleeping Sickness Diary.** [HEARSEY (H.), Principal Medical Officer.] 1913. August 31. Part 21. 11 pp. Zomba: Government Printer.

During the four months previous to August 31st 25 cases of sleeping sickness were notified. These added to those previously reported make a total of 153. Details of these 25 cases are given. As was stated in the last issue of the Diary (see this *Bulletin*, Vol. 2, p. 346), a reinvestigation of the contiguous fly-infested districts, to the north and south of the Proclaimed area in the Dowa district, was shortly to be undertaken. Three months' investigation was allotted to each of the following four districts.

Marimba district.—Seven cases were found in a month by Dr. MORGAN; six of them were discovered in the northern portion of the fly area and one case in the extreme southern part of the district where the Marimba and Dowa fly areas merge.

Dedza district (between the Lintipe river and South Nyasa district).—The reinvestigation of this district was undertaken by Dr. DAVEY; after a most painstaking search for three months no cases were discovered. As in the past, failure was attributed to the unfavourable attitude of the natives and to an entire lack of co-operation on their part.

South Nyasa district.—Two cases were found by Dr. SANDERSON.

Upper Shire district.—This area is to be investigated by Dr. SANDERSON.

The object of these investigations is to demonstrate that the disease is to be found wherever there is tsetse fly. An effort is now being made to substitute facts for conjecture, with a view to inducing people living in or passing through fly areas to appreciate the danger and to adopt the necessary precautions. For, however small the risk of infection may be, the fact remains, the author writes, that the disease is invariably fatal within a short period.

Preventive measures.—These may be briefly summarised as follows:—

"1. Impressing upon the natives the necessity of avoiding being bitten by flies.

"2. Clearing for a distance of 300 yards or more round villages situated in close proximity to fly. Extending these clearings in many instances so as to embrace their food gardens also.

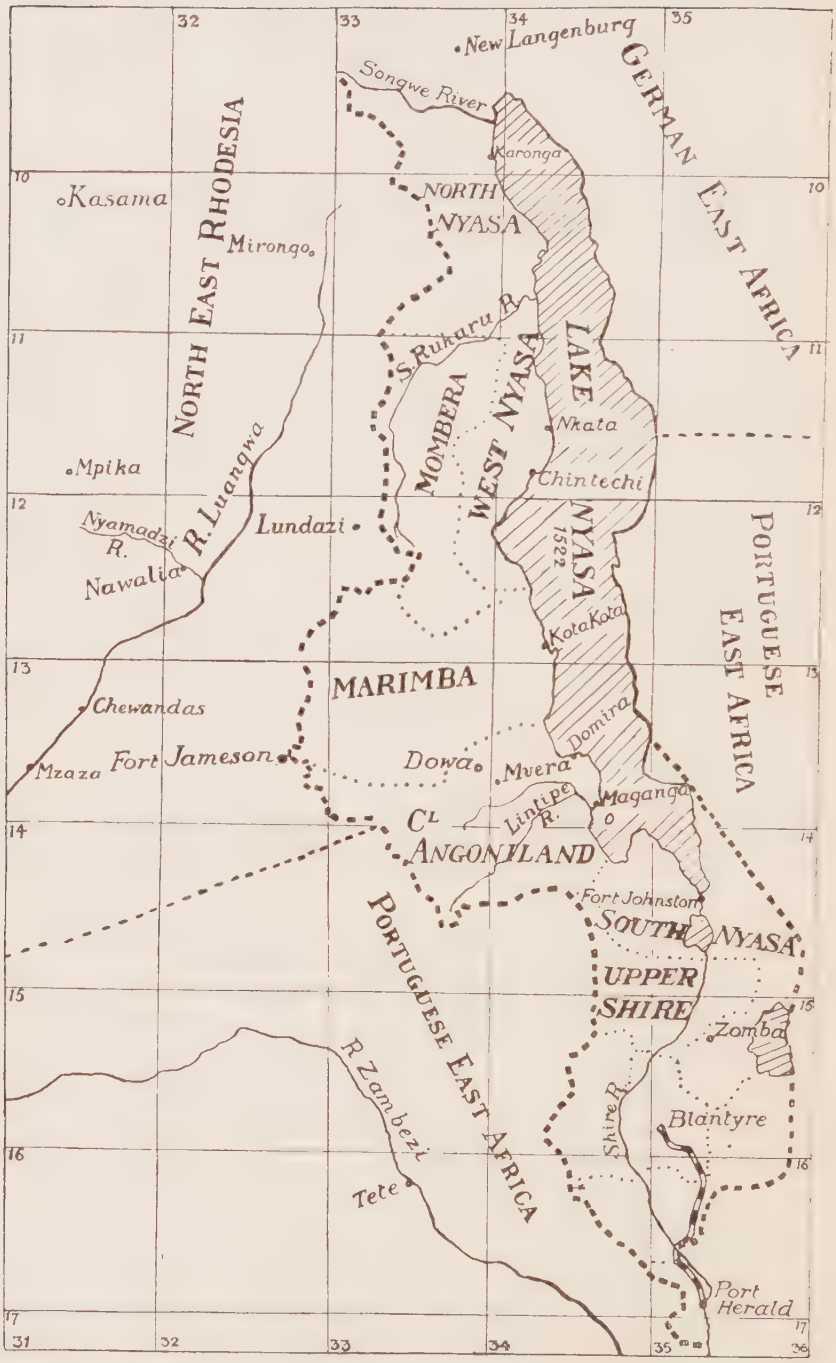
"3. Making clearings on each side of roads and main paths leading from one village to another, thus uniting groups of villages and enabling the natives to journey from one to another with commensurate safety.

"4. Instructing the natives to use this felled timber for firewood, and to avoid visiting the adjacent fly-infested woods for this purpose.

"5. Instituting public latrines in all the villages, to prevent natives from visiting the adjoining woods for the purpose of defaecation.

"6. Prohibition as to the firing of grass till the month of October, when only it is fit for burning, so as to ensure as large and as effectively cleared areas as possible.

"7. Removal, whenever feasible, of villages situated in danger zones to fly-free areas."



SKETCH Map, showing NYASALAND PROTECTORATE and adjoining territories.

Scale about 85 miles to 1 inch.

To expedite clearing operations, axes and heavy knives have been supplied to natives in the Sleeping Sickness Area. The supervision of the clearing operations has been placed in the hands of Medical officers' patrols and police employed in the area. All the work is being done by the villagers themselves without payment of any kind.

Treatment.—Various treatments have in the past been given a trial:—(1) Atoxyl alone, (2) Atoxyl with intermediate doses of perchloride of mercury, (3) Soamin, (4) Salvarsan, (5) Tartar emetic, (6) Dye, B.S. In no case was there recovery or even distinct improvement.

W. Yorke.

May (S. Aylmer). **Report on Sleeping Sickness in Northern Rhodesia. Feb. 1912 to Oct. 1913.**—Report to the British South Africa Company. Received in Colonial Office December 15, 1913.

This report is divided into two portions, the first dealing with the Luapula, Mweru and Tanganyika Sleeping Sickness (*G. palpalis*) areas, and the second with *G. morsitans* transmitted human trypanosomiasis.

A very satisfactory state of affairs exists as regards the Luapula, Mweru and Tanganyika areas; the whole country to the east of the Luapula and Lake Mweru has been depopulated and it may now be reasonably considered that practically all risks of extension of the disease is at an end. Only one case was discovered during the past year. There are in all 23 cases under treatment. The restrictions formerly in force have been modified and only those portions of the Luapula, Mweru and Tanganyika districts which have been depopulated are included as closed area; the boundary lines are given. The Tanganyika, Mweru and Luapula divisions have been reported on respectively by Dr. W. H. Storrs, the late Dr. Master and Dr. E. E. Storrs.

Since the date of the last Report* (Feb. 1912) 29 cases of the *G. morsitans* transmitted disease have been found. These bring the total number of cases recorded since August 1909 up to 95. Details are given of the localities in which these cases were found. The Mpika portion of the Luangwa closed area was re-examined by Dr. Kinghorn in May and June 1913. It is estimated that 91 per cent. of the total adult population was palpated. The death rate (from all causes) for the district is 37·8 per thousand. The total number palpated was 2613; details as to the state of the glands are given in a table. All those with + or + − glands were punctured and trypanosomes found in the gland juice of two. Kinghorn writes.—

"So far as it is possible to judge, therefore, the outlook is distinctly encouraging. The villages in this portion of the Sleeping Sickness area were visited at periods varying from 18-24 months previous to the present occasion, and whereas eight cases were then diagnosed only two have been isolated this year. Strong support is afforded, accordingly, to the view that the disease is of old standing in the Luangwa valley and that it has

* Summarised in *Sleeping Sickness Bulletin*, Vol. 4, p. 195–202.

now reached a state of comparative equilibrium. Were this not the case it might have been expected that the disease would have made more pronounced strides in two years, more particularly in view of the general lowering of vitality which must have occurred in the natives during the period of semi-starvation which existed last year. The general health of the community now appears to be satisfactory."

Fundu medical examination and detention camp.—This station was established in January 1912 with the following objects:—

(1) Medical examination and detention of natives travelling to Southern Rhodesia from the Luangwa closed area and Nyasaland. (2) To establish a station for the southern part of the Luangwa closed area from which the population of the surrounding district could be periodically examined. (3) To provide medical assistance and treatment for natives of the surrounding districts.

Since the establishment of this station some 17,000 natives have passed through for work in Southern Rhodesia and 4 cases of trypanosomiasis have been found, 3 amongst the natives going south and the other from a neighbouring district. The disease has not been discovered in any native subsequent to his having passed through this camp.

The author writes that no satisfactory explanation can be offered to account for the failure of the disease to spread under the apparently eminently favourable conditions which exist in the greater part of the Luangwa valley. It may be suggested (1) that the disease is an old one and that the bulk of the population is immune; (2) the source of supply of infection, namely the extent to which the game is infected with *T. rhodesiense*, may not be so extensive as is at present thought; (3) the fact that the disease tends to be localised in certain areas and along the main roads would suggest that there is still a link wanting in the chain of evidence in favour of the 'Fly' and 'Game' trypanosomes being identical with that which causes human trypanosomiasis.

The next section of the report deals with the relationship of game to human trypanosomiasis. The advisability of undertaking an experiment to determine the relationship which exists between game and fly, and incidentally between game and human trypanosomiasis is discussed. The Lukasashi valley, north of the Mkushi-Petauke road was examined by Mr. Ll. Lloyd and found to be in every respect an eminently suitable place for such an experiment. Before attempting an experiment of this magnitude and nature careful consideration is required of (1) the cost, (2) the probable result, (3) the possibility of arriving at a correct conclusion as to the interpretation of the result. It was estimated that the experiment would cost £11,350. One or other of the following conditions will be found to result from this experiment. (*a*) The total disappearance of fly from the area cleared of game; (*b*) a diminution in the amount of fly present; (*c*) unchanged conditions as regards the presence of fly. [The author has omitted to mention the effect on the infectivity of the fly. This is certainly one of the most important pieces of information required.] May goes on to discuss the feasibility of correctly interpreting any results which might be obtained and concludes that it would not be possible. He writes:—

"A study, therefore, of all the circumstances bearing on the experimental destruction or removal of the game from a selected area, owing to the large expenditure involved, our present ignorance of the bionomics of this fly, and therefore our inability to correctly interpret the results following this experiment, does not lead to the opinion that this experiment would be justified by its results.

"Our knowledge of the facts bearing on the relationship of sleeping sickness to big game, and our knowledge of the present position of the disease do not justify the agitation which at present exists for the general destruction of game as a preventative of the spread of this disease.

"Until there is definite proof (1) that the disease is spreading, (2) that the game is responsible for the maintenance of the fly, (3) that the game is the only reservoir of the disease, or even the chief one, and (4) that the conditions following the destruction of the game will be an improvement on those which at present exist, it is a reasonable conclusion that the presence of this disease as it now exists does not afford sufficient excuse for killing out the game. . . . There is . . . increasing reason to think that the disease is an old one and has arrived at a condition of equilibrium. . . . Its present condition requires no hasty or drastic measures 'for extirpating the living reservoirs of sleeping sickness' the grounds for which are purely hypothetical and unreliable."

The following measures are recommended:—

1. Natives in fly areas should be prohibited from keeping domestic animals, goats, sheep, dogs, &c.
2. They should be encouraged by means of trapping, pits, drives, and if possible by being allowed a certain number of firearms, to clear the vicinity of all villages in fly country of game; except in the vicinity of villages game should be as far as possible unmolested in order to prevent their movement into areas free of infection.
3. That cultivated lands should be protected by clearings so that the grass can be completely burnt without endangering the crops.
4. Every effort should be made to get rid of fly by trapping, &c.
5. Certain routes only should be used by natives and others travelling through these areas and these routes should as far as possible be rendered safe both by the removal of infected cases and by the encouragement of game destruction in their vicinity.

A recommendation has been submitted for the relaxation of the present stringent rules and regulations governing the movements of natives in the Luangwa closed area.

The report closes with a general programme of entomological work which is to be undertaken.

[The recommendations of the author seem rather inconsistent with the general argument of the paper. He doubts the identity of the "Game" and "Fly" trypanosome with that infecting man but proposes to clear the game from the vicinity of villages and main roads, presumably in case he should be wrong. This procedure is none other than the "hasty or drastic measure the grounds for which are purely hypothetical and unreliable" proposed by the reviewer in the discussion at the Zoological Society and elsewhere, and referred to and severely criticised by May in the present paper.]

W. Y.

SCHILLING (Claus). **Beobachtungen über die Schlafkrankheit in Uganda.** [Observations on Sleeping Sickness in Uganda.]—*Deut. Med. Wochenschr.* 1913. Oct. 23. Vol. 39. No. 43. pp. 2094-2096. With 2 text-figs.

In this paper an account is given of the prophylactic measures adopted in Uganda (kingdom) against sleeping sickness. The

author points out that during the past 18 months no deaths from sleeping sickness have been notified by the chiefs. The native population is intelligent, understands the significance of the disease, and appreciates the measures adopted by the Government. Moreover, deaths are speedily notified on account of taxation.

The condition of affairs in Busoga, Toro and the Nile district is different. In these localities there is still much sleeping sickness. The people are given six months in which to move to fly-free areas; at the end of this time all the canoes are collected and burned, and the villages destroyed.

An account is given of the clearing operations which have been undertaken at Entebbe, Port Bell and Jinja.

W. Y.

MACFIE (J. W. Scott) & JOHNSTON (J. E. L.). **Auto-Erythrophagocytosis as an Aid to the Diagnosis of Trypanosomiasis.**—*Jl. London School Trop. Med.* 1913. Nov. Vol. 2. Pt. 3. pp. 212-215.

Reference is made to the work of CONNAL on this subject (see *Sleeping Sickness Bulletin.* Vol. iv. p. 189). The authors have examined a number of animals infected with trypanosomes (*T. lewisi*, *T. nigeriense* and *T. duttoni*) and have noticed this ingestion of red cells. The number of erythrocytes ingested by a single leucocyte varied from one to twelve or even more. The ratio of cells containing erythrocytes to other leucocytes is, as a rule, very low; it is seldom over 1 per cent., but in one mouse it was no less than 11·5 per cent.

The cases in which phagocytosis of red cells were found are divided into the following three groups:—

Group A. In which leucocytes containing red cells were present in blood which later showed trypanosomes.

Group B. In which both were present at the same time.

Group C. In which phagocytosed red cells were seen after the disappearance of the trypanosomes.

The phenomenon was also observed in one case of blackwater fever and in a guineapig inoculated with blood from a case of yellow fever.

The authors put forward the suggestion that erythrophagocytosis may be of material aid in the diagnosis of trypanosomiasis.

W. Y.

TRANSMISSION.

ECKARD (B.). **Uebertragung des *Trypanosoma rhodesiense* durch die *Glossina palpalis*.** [The Transmission of *T. rhodesiense* by *G. palpalis*.]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1913. Nov. 26. Vol. 72. No. 1/2. pp. 73-76.

Since KLEINE showed that trypanosomes underwent a developmental cycle in Glossina much work has been done on this subject.

The chief results obtained in transmission experiments are given in chronological order in the following table:—

TABLE.

Observers.	Species of Trypanosome.	Species of tsetse.	Locality.
Kleine	*T. brucei.*	*G. palpalis.*	G. E. Africa (L. Victoria).
Kleine	*T. gambiense.*	*G. palpalis.*	G. E. Africa (L. Victoria).
Bruce, Hamerton, Bateman & Mackie.	*T. gambiense* and T. of dimorphic type.	*G. palpalis.*	Uganda (L. Victoria).
Bruce, Hamerton, Bateman & Mackie.	*T. vivax.*	*G. palpalis.*	Uganda (L. Victoria).
Bouffard	*T. cazalboui* (= *vivax* ?).	*G. palpalis.*	Senegambia.
Bouet & Roubaud ...	*T. cazalboui.* *T. dimorphon.* *T. pecaudi.* (= *brucei* ?).	*G. palpalis.* *G. tachinoides.* *G. longipalis.*	Dahomey.
Fehlandt	*T. congolense.*	*G. morsitans.*	G. E. Africa (L. Tanganyika)
W. Fischer	*T. brucei.*	*G. palpalis.*	G. E. Africa (L. Tanganyika).
Kinghorn & Yorke ...	*T. rhodesiense.*	*G. morsitans.*	N. Rhodesia.
Duke	*T. nanum.*	*G. palpalis.*	Uganda (L. Victoria).
Kleine & Fischer ...	*T. gambiense.*	*G. morsitans.*	G. E. Africa (L. Victoria).
Fraser & Duke ...	*T. uniforme.*	*G. palpalis.*	Uganda (L. Victoria).
Bouet & Roubaud ...	*T. dimorphon.*	*G. morsitans.*	Senegambia.
Rodhain, Vandenbranden, Pons & Bequaert.	*T. cazalboui.*	*G. morsitans.*	Congo.
Kinghorn & Yorke ...	*T. rhodesiense.* *T. pecorum* (= *T. congolense* ?). *T. simiae.*	*G. morsitans.*	N. Rhodesia.
Bruce, Harvey, Hamerton, Davy & Lady Bruce.	*T. simiae.*	*G. morsitans.*	Nyasaland.
Ph. Ross	T. of dimorphic type.	*G. longipennis.*	British E. Africa.
Kleine & Fischer ...	*T. gambiense.*	*G. morsitans.* *G. palpalis.*	G. E. Africa (Central).
Bruce, Harvey, Hamerton, Davy & Lady Bruce.	*T. caprae.*	*G. morsitans.*	Nyasaland.

These observations all point to the fact that, given favourable climatic conditions, any known pathogenic trypanosome can develop in any species of Glossina. Whether one or another species of tse-tse fly is specially favourable for the spread of trypanosome disease can only be answered by a series of parallel experiments conducted under similar conditions, and by further observations in nature. The author had the opportunity in Tanganyika of conducting transmission experiments with

T. rhodesiense and *G. palpalis*. The trypanosome was obtained from a case of sleeping sickness in Nyasaland.

The experimental procedure was as usual; 476 laboratory bred *G. palpalis* were fed in series for four days on an infected guinea-pig and after being starved for two days were fed on different healthy goats and monkeys. Trypanosomes were found for the first time in certain of the animals on the 32nd day. By dividing up the flies into groups it was found that, in all, 12 (2·5 per cent.) became infective. In addition developmental forms of trypanosomes were found in 9 other flies which had died by the 10th day.

Three of the infective flies were employed for the purpose of examining the infectivity of the parasites in the various organs. After they had been fed for two days on healthy animals they were killed with chloroform (40th day of the experiment = age of the fly). The salivary glands, proventriculus and intestine were then dissected out and separated and the contents injected into 9 healthy monkeys. All the animals proved to be infected on the 5th day afterwards. These results agree with those obtained by Kinghorn and Yorke with *G. morsitans* and *T. rhodesiense* (this *Bulletin*. Vol. 1. p. 268). They are however in striking contrast to those of Kleine and Eckard (*loc. cit.* Vol. 2. p. 32) and of Miss Robertson (*loc. cit.* Vol. 1. p. 267) the former of whom, working with *G. palpalis* and *T. gambiense*, did not succeed in infecting monkeys with the gut or proboscis contents of infective flies; only the contents of the salivary glands proved to be virulent.

Since it is probable that the developmental process of *T. rhodesiense* and *T. gambiense* in Glossina is similar, a reason must be sought for these different experimental results. The possibility that injury of the salivary glands during removal and consequent fouling of the other organs might account for the infectivity of the latter is considered, but the author is of opinion that the experiments are too numerous to allow of this interpretation. Possibly the age of the fly might offer an explanation; those employed by Kleine and Eckard were on an average 50 to 60 days old, whereas those of the present series of experiments were only 40 days old. To decide the point an infective fly was kept alive until the 54th day and then dissected. In this case only the monkey which received the salivary glands became infected. On microscopic examination very numerous trypanosomes were seen in a piece of the gut. Therefore the author concludes that the development of the trypanosomes in the intestine after a time gradually comes to an end and that the virulent parasites migrate into the salivary glands. [Kinghorn, Yorke and Lloyd found that both the contents of the salivary glands and also that of the intestine of two infective flies were virulent when injected into healthy animals 58 and 71 days after the infecting feed.]

W. Y.

Diesing. **Die Uebertragung der Schlafkrankheit durch den Geschlechtsakt.** [The Transmission of Sleeping Sickness by Sexual Intercourse.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1913. Nov. Vol. 17. No. 22. pp. 786-788.

Reference is made to the fact that in South Kamerun the distribution of sleeping sickness and *Glossina palpalis* does not

always coincide; sometimes the insect is found without the disease, sometimes the disease without the insect. This fact supports the view that there must be another means of transmission. The author considers that possibly coitus may play an important part.

On his first journey to Kamerun in 1902 the author took with him four dogs of which one was infected with *T. lewisi* (sic). In the cage on the ship the dogs quarrelled and bit one another. Ten days later two other animals were found to be infected. The only explanation of this surprising result was that the virus had been transferred by direct contact of the wounds or by the tongue licking first a wound on the infected animal and then on a healthy animal.

When working with large numbers of horses, donkeys and cattle in Kamerun the author observed that those animals used for breeding purposes were always the earliest and most severely infected with trypanosomiasis. He came to the conclusion therefore that coitus must be responsible for the dissemination of the disease. Just as the trypanosome was transmitted in the dogs by direct contact of wounded surfaces, so it was quite likely that the same thing would happen in coitus where there were frequently small abrasions of the parts. Reference is made to the fact that this is the usual mode of transmission of dourine.

The author is of opinion that the two dozen infected Europeans who return to Europe each year to be treated constitute a danger, and suggests that an intermediate station should be established at the Canaries where these people could be treated efficiently.

W. Y.

MACFIE (J. W. Scott). **Preliminary Note on the Development of a Human Trypanosome in the Gut of** *Stomoxys nigra.—Ann. Trop. Med. & Parasitology.* 1913. Nov. 7. Vol. 7. No. 3 B. pp. 359-362. With 1 text-fig.

A number of *Stomoxys nigra* were fed at Lagos on a guineapig infected with the human trypanosome which the author has called *T. nigeriense* (see this *Bulletin*, Vol. 2, p. 344). Thirteen of the flies were dissected from one to six days after the first feed. In six of them flagellates (Herpetomonas) were found in the mid-gut. As a control, twelve flies that had not fed on the infected animal were dissected. No flagellates were found in them.

As it was possible that the flies might have been naturally infected, experiments were begun with flies hatched out in the laboratory. Two experiments with a single fly were done. In each a laboratory bred fly which had hatched out the previous day was fed on an infected guinea-pig. The flies were killed and examined on the 3rd and 4th days respectively. Herpetomonas were found in the mid-gut of each; no flagellates were found in the proboscis or salivary glands. As a control two other laboratory bred *Stomoxys nigra* which had not fed on an infected guineapig were examined; no flagellates were found in either.

At this stage the work had to be abandoned, but the two experiments mentioned were quite definite and " would seem to

prove that the trypanosome with which the guineapig was infected was capable of development in the gut of *Stomoxys nigra.*"

In Nigeria, in the native towns and European stations, stomoxys abound. If they are capable of serving as the intermediary host of human trypanosomiasis, they deserve greater consideration than they at present obtain.*

W. Y.

NEIVA (Arthur.) **Da Transmissão do *Trypanosoma cruzi* pela *Triatoma sordida* Stal.** [Transmission of *Trypanosoma cruzi* by *Triatoma sordida.*]—*Brazil Medico.* 1913. Aug. 8. Vol. 27. No. 30. p. 309.

In the city of Porto Nacional in the State of Goyaz, Brazil, the author found a difficulty in explaining the greater number of persons infected with *T. cruzi,* seeing that *Triatoma megista* was very infrequent. On the other hand an abundance of *T. sordida* was met with here and elsewhere. The author attempted to infect specimens of *T. sordida* by feeding them on guinea-pigs infected with *T. cruzi.* The bugs showed many flagellates in their gut. The dejecta, as expelled naturally, were collected and put in contact with the conjunctiva of guinea-pigs. These became infected within eight days.

A. G. B.

NEIVA (A.). **Multiplicação no Vinchuca (*Triatoma infestans,* Klug.) do Trypanosomo do Mal de Cadeiras.** [Multiplication in the Vinchuca of the Trypanosome of Mal de Caderas.]—*Brazil Medico.* 1913. Sept. 15. Vol. 27. No. 35. pp. 366-367.

A preliminary note, in which the author expresses the opinion that the capybara is not the wild host of the organism of mal de caderas, as suggested by ELMASSIAN and MIGONE. In the course of a long journey made on horseback through several states of Brazil for other purposes, he found no correspondence between the distribution of the capybara and the prevalence of mal de caderas. In several places where the inhabitants were not even familiar with the appearance of the capybara, mal de caderas was causing considerable ravages. The author also thinks that the gadflies of the genus Chrysops are much more likely to be the transmitters of the disease than *Stomoxys calcitrans,* as suggested by SIVORI and LÉCLER in 1902. Finally he briefly announces that he has been able experimentally to infect with the trypanosome (*T. equinum*) of mal de caderas the vinchuca (*Triatoma infestans*) without loss of virulence; its faeces, when placed upon the conjunctiva of guinea-pigs, proved infective at the end of 10 to 15 days.

W. Y.

* A. C. H. GRAY in Uganda in 1905 found and figured a Herpetomonas from three specimens of Stomoxys species. They had previously fed on a monkey infected with *T. gambiense.* "Practically unaltered" *T. gambiense* also were present in one of the flies 24 hours after feeding.—A. G. B.

MITZMAIN (M. Bruin). **The Mechanical Transmission of Surra by *Tabanus striatus* Fabricus.**—*Philippine Jl. of Science.* Sec. B., Trop. Med. 1913. June. Vol. 8. No. 3. pp. 223-229.

An attempt was made to transmit surra mechanically by means of *Tabanus striatus*, which were for the most part bred from the egg; in some instances the flies were obtained from larvae taken from their aquatic habitats and in a few instances captured adult flies were employed.

In a table details are given of 16 experiments; the number of flies used in each was either one or two, except in two instances where it was 3 and 6 respectively. Three of the 16 experiments were positive. In the first of these, 3 flies bred from eggs were applied individually in tubes to an infected guinea-pig and allowed to feed from 30 to 90 seconds. They were then transferred to a healthy monkey after intervals of from 20 seconds to 3 minutes and allowed to feed until satisfied (5, 16 and 21 minutes respectively). Trypanosomes were found in the blood of the monkey 11 days later. In the second, two laboratory bred flies were fed on an infected horse for 40 to 45 seconds and then after intervals of 5 to 15 seconds permitted to complete their meal on a healthy horse, which subsequently became infected. The third experiment was similar to the second except that six caught flies were employed.

An effort was made to induce flies to feed on a healthy and on infected animals kept together in a large screened cage. The results were negative, the flies dying in a few days when kept within the enclosure.

The following are the conclusions:—

"1. *Tabanus striatus* Fabricus for the first time recorded has been found to play a rôle in the transmission of surra. Bred horseflies have been employed for the first time in such experiments. Errors resulting from naturally infected wild flies have thus been eliminated.

"2. Three experiments were successful in the direct or mechanical transmission by "interrupted" feeding when only a short interval was allowed between the bites on infected and healthy animals. In 16 experiments the minimum number of flies with which the infection could be transmitted was 2.

"3. Trypanosomes of surra were not found to be transmitted hereditarily in *Tabanus striatus* Fabricus.

"4. The contaminated labellum of the fly does not appear to be a factor in the conveyance of infection.

"5. The maximum length of time that *Trypanosoma evansi* has been demonstrated microscopically in the gut of this species of fly after feeding on infected blood is thirty hours; the organisms were found in the fly's dejecta two and one-half hours after biting the infected animal; and suspensions of flies, when injected subcutaneously, were found infective for animals for a period of ten hours after the flies had fed on infected blood."

W. Y.

TRYPANOSOMIASIS IN RELATION TO WILD ANIMALS.

DUKE (H. L.). **Some Trypanosomes recovered from Wild Game in Western Uganda.**—*Rept. of the Sleeping Sickness Commission of the Royal Society.* 1913. No. 14. pp. 37-59. With 4 plates and 1 map.

The Western Province of the Uganda Protectorate—a great game country with a relatively small population—was examined

with the object of obtaining information on the part played by wild game in the spread of trypanosomiasis. On the accompanying map the main data available regarding the distribution of the Glossina species are given. The bulk of the experiments were performed in areas where tsetse were more or less abundant.

The tsetse regions traversed may be roughly divided into four:—

District No. 1.—The north-west corner of Ankole Province, as defined by the north-east shore of Lake Edward, the Kazinga Channel and the south-west corner of Lake George.

District No. 2.—The parts of Toro Province from the northern bank of the Kazinga Channel to the neighbourhood of Mahokya and the Hima river.

District No. 3.—The Southern Toro Game Reserve, comprising the country round the northern end of Lake George, and running northwards nearly to Fort Portal.

District No. 4.—The Semliki valley north of the Mboga road.

A description is given of the physical characters and predominant game species of each of these districts. Another series of wild animals was shot in districts where no tsetse are known to occur; these experiments were to serve as a control to those on game in tsetse districts.

Technique.—The blood from the freshly killed animal was defibrinated, and at the same time two slides were taken for subsequent staining, each of which received from 20 to 30 mins. careful examination. In order to include as many species of trypanosomes as possible goats were used for the blood inoculations. It is regretted that it was not possible to devote a separate goat to each wild animal shot. At the beginning of the tour an attempt was made to set aside a goat for each species of game, and so to discover the relative infectivity of the different species. As time went on, however, this was found impossible; nevertheless a certain amount of grouping was maintained throughout the experiments, resulting in a "buffalo goat," a "waterbuck goat" and so on.

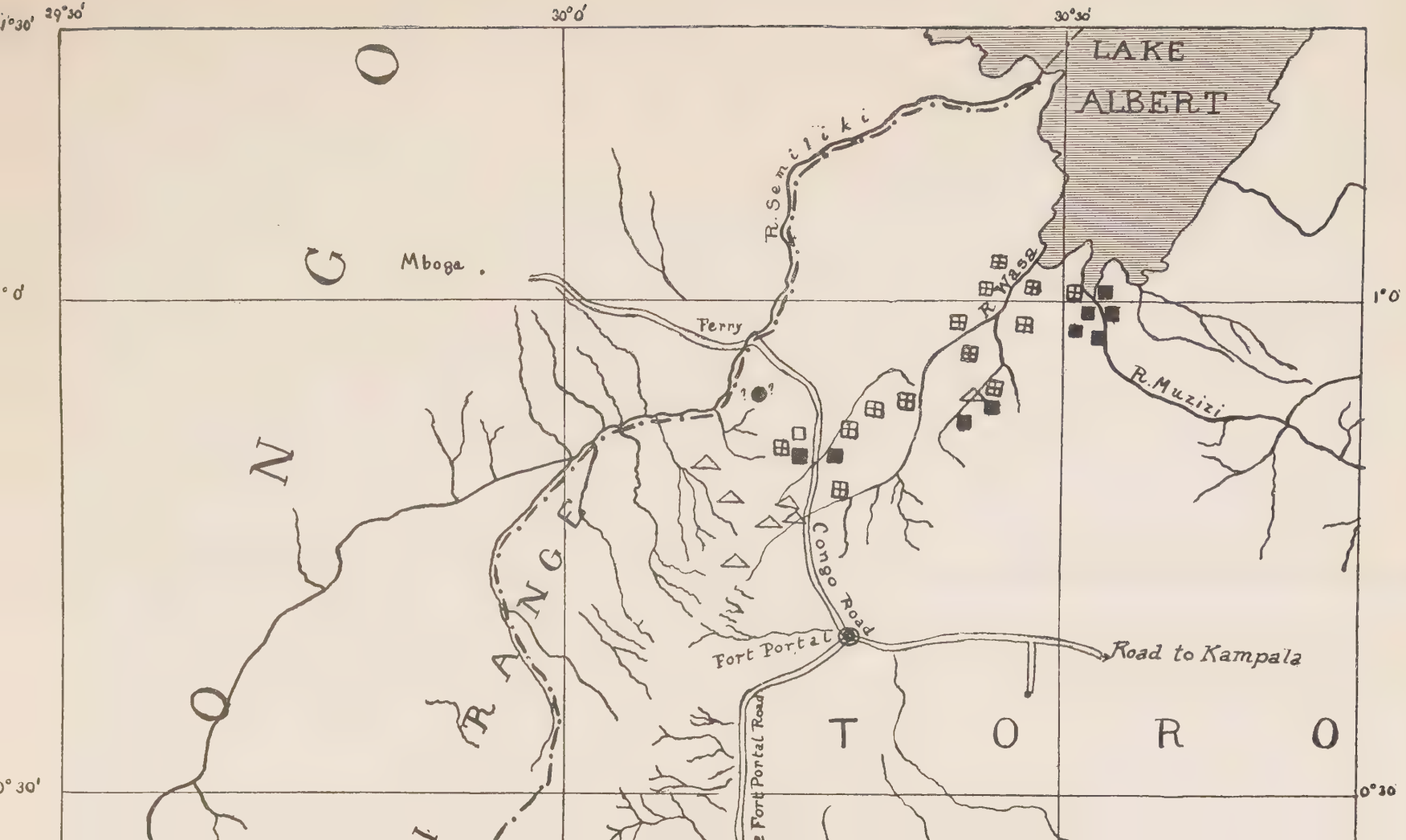
The following is a summary of the goats inoculated:—

Goat A.—Inoculated from 2 buffalo in the blood of which trypanosomes resembling *T. vivax*, *T. pecorum*, *T. uniforme* and another very suggestive of some *T. gambiense*-like organisms were found. Trypanosomes appeared in the goat on the 6th day after inoculation. Subinoculations were made into a second goat, 2 dogs, a rat, a monkey and a bullock. *T. pecorum* appeared in the blood of the dogs, the rat and the bullock. The monkey did not become infected. *T. uniforme* was seen in the blood of Goat A. The *gambiense*-like organism was also seen in the blood of this goat and also in the dog's blood.

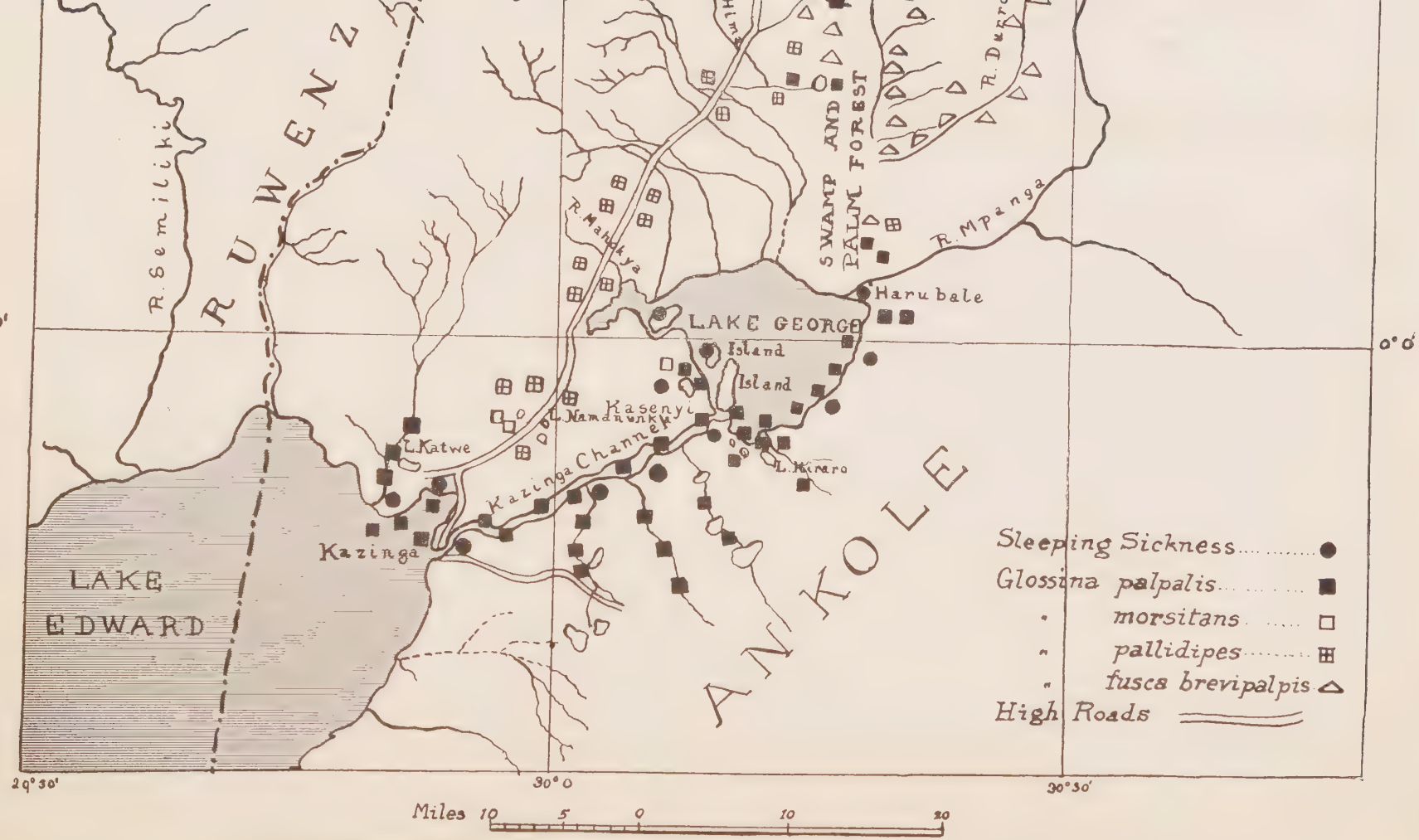
Goat B.—This animal became positive after being inoculated with blood from 3 waterbuck. No parasites were seen in the blood slides of the buck. The goat unfortunately died owing to the carelessness of the porters.

Goat C.—This animal was inoculated with blood from 7 waterbuck, 3 elephant and 1 hartebeeste. It did not become infected. Parasites resembling *T. vivax* and *T. uniforme* were seen in blood films of one of the waterbuck.

Goat D.—Inoculated from 3 Uganda cob and 2 bushbuck, none of which showed trypanosomes in the blood. The goat became infected and subinoculations were made into a second goat, 2 dogs, 2 rats and a monkey. Only the goat became infected. The parasites found correspond to *T. nanum* and *T. uniforme*.



29°30'
30°0'
30°30'
1°0'
0°30'
LAKE ALBERT
R. Semiliki
R. Wasa
R. Muzizi
Mboga
Ferry
Congo Road
Fort Portal
Road to Kampala
Fort Portal Road
T O R O
O N G O
RANGE



Outline Map of portion of WESTERN PROVINCE, UGANDA PROTECTORATE, to illustrate Dr. H. L. DUKE's paper.

Goat E.—Inoculated from 4 reedbuck and 1 bushbuck none of which showed trypanosomes in the blood. The goat became infected and subinoculations were made into 2 goats, a dog, a rat, a monkey and a guinea-pig all of which became infected. The trypanosomes found were *T. nanum*, *T. uniforme* and a trypanosome belonging to the *brucei-gambiense-pecaudi* group.

Goat F.—Inoculated from 9 buffalo and a warthog, one of which showed trypanosomes in the blood. The goat became infected and 2 dogs, 2 rats, and a monkey were subinoculated. These did not become infected. The goat was infected with *T. nanum* and *T. uniforme*.

Goat G.—Inoculated from 2 reedbuck, a bushbuck, an eland and a warthog, in none of which trypanosomes were found. The trypanosome found in the goat was *T. uniforme*.

Goat H.—Inoculated from 2 giant pigs, 3 waterbuck, a reedbuck, a cob and a colobus monkey, in blood films of none of which trypanosomes were found. The goat became infected and subinoculations were made into 3 rats, a monkey and a dog all of which remained negative. The parasites in the goat were *T. vivax* and *T. nanum*.

Goat I.—Inoculated from a buffalo and a hyaena; trypanosomes were found in the blood of the hyaena. The goat became infected and subinoculations were made into 5 rats, 2 monkeys and 2 dogs; a number of these animals became infected. The trypanosomes found were *T. pecorum*, *T. uniforme*, and a slender *T. gambiense*-like organism.

A number of animals including waterbuck (6), buffalo (7), reedbuck (3), mpala (6), eland (1), duiker (1), lion (1), hartebeeste (6), oribi (6), warthog (2) were shot in fly-free country and blood from them was inoculated into goats; all the goats remained negative. Trypanosomes were only found in one antelope—a duiker shot near Masaka—in the course of examination of these blood slides. This animal was shot a considerable distance from the lake shore in a region where tsetse are unknown. It is possible, however, that it may have sometime or other reached the fly zone on Lake Victoria.

In the fly area 52 animals were inoculated from and examined microscopically, and trypanosomes were found on at least 10 occasions, *i.e.*, 19 per cent., taking the lowest possible estimate of one infected wild animal to each infected goat. In the fly-free area 39 animals were similarly examined and trypanosomes were found in only one instance, *i.e.*, 2·5 per cent. There is, accordingly, no reason to doubt the significance of Glossina as trypanosome carriers among game, since Tabanids, Haematopota, Muscidae, Chrysops, &c., are common to both regions.

The following experiments were carried out with wild Glossina. These were fed upon clean monkeys which were subsequently examined daily; a certain number of flies were afterwards dissected with a view to examining roughly the gut and proboscis.

District 1.—368 *G. palpalis*, caught elsewhere than at Lake Kiraro, were fed upon a clean monkey without causing any infection. Of these 101 were dissected without any flagellates being discovered. 507 Kiraro flies were fed on a clean monkey which became infected subsequently. The 90 flies examined proved to be negative.

District 2.—117 *G. pallidipes* were fed on a monkey with negative results. One of 123 *G. pallidipes* dissected was found to contain trypanosomes in the gut; the proboscis and salivary glands were negative.

District 3.—210 *G. palpalis* were fed on monkeys and 191 dissected with negative results, whilst trypanosomes were found in the gut of one out of 157 dissected.

District 4.—298 *G. palpalis* were fed on monkeys with negative results; and of the 185 dissected 2 contained trypanosomes in the gut (proboscis negative, salivary glands not seen). The flagellates of Fly No. 1 showed

crithidiae, trypanosomes and intermediate forms suggestive of a single cycle; those of Fly No. 2 showed scarce slender trypanosomes. 48 *G. pallidipes* were fed on monkeys with negative results, and 59 were dissected, trypanosomes being found in the gut of one. 15 *G. fusca* were fed on monkeys with negative results and of 28 dissected trypanosomes were found in the gut of one only.

The diagnosis of the trypanosome obtained from wild tsetse caught at Kiraro Lake is dealt with in some detail. Both as regard morphology and pathogenicity it corresponds to the *brucei* and *rhodesiense* type, posterior nuclear forms being seen.

An account is given of the coincidence of distribution between certain species of tsetse and of game. *G. fusca* is chiefly confined to forest areas and in the author's experience elephant, giant pig and bushbuck are the most constant frequenters of these *fusca* haunts. The parts of Toro around Katwe, Mahokya, and Kasesse consist of short grass plains running up to the elephant-grass country around the Hima river. The whole of this area swarms with buffalo. *G. palpalis*, *pallidipes* and *morsitans* are found, but *fusca* appears to be most met with in the forests to the north and east of the Hima river. Hippo, where they occur, doubtless constitute the important food supply of *fusca*, but their range is limited to certain lakes and streams.

G. palpalis in the parts visited also occurs in the forested area only, differing from *fusca* in its confinement to the neighbourhood of water. In the consideration of its food supply man will take a prominent place, and hippo are very often found in the haunts of this tsetse.

G. pallidipes occurs throughout the buffalo district referred to above, and is chiefly found in open forest areas and in scrub country. It is also met with in isolated thickets a considerable distance from the scrub which borders the open tracts. It is thus mostly associated with reedbuck, buffalo, cob and especially waterbuck.

A species of *Hippobosca* was seen on almost every antelope shot in this part; as many as 12 were caught around one waterbuck. They were also taken on a reedbuck shot out on the plains far away from the scrub. This fly was never seen on game shot in the Semliki valley which is 3,000 to 4,000 feet lower than the rest of the country. It is possible that this species may play a part in the spread of trypanosomes, and in tsetse-free districts may account for the existence of disease amongst cattle. Dissection of 15 individuals of this fly proved negative.

The following are the conclusions:—

"1. A considerable portion of the wild game in the fly districts of the Western Province of the Uganda Protectorate is infected with trypanosomiasis.

"2. Certain of these trypanosomes have suspicious resemblance to the human trypanosomes, *T. gambiense* and *T. rhodesiense*. Others are known to be exceedingly pathogenic to domestic animals.

"3. The tsetse of these parts also contain flagellates which it is highly probable are derived from wild animals.

"4. The population of the fly districts is scanty, and the greater part has recently been moved to fly-free parts.

"5. It is reasonable to hope that, as regards the spread of human trypanosomiasis, the removal of the people from the infected districts will

suffice, and this measure will simultaneously prevent native cattle being exposed to the fly bite. The majority of the fly area is practically uninhabited country.

"6. The alternative of destroying the game, and so of abolishing what is doubtless a permanent trypanosome reservoir, would be a gigantic and almost impossible undertaking in this region. In considering such a proposal elephant must, of course, be included, as must also hippo, situtunga, bush pig and hyaena, all of which are difficult to eradicate. The scarcity of people is a serious objection to such a course, as is the difficult nature of the country. It would be well to await the trial of this expedient under more favourable conditions before undertaking so drastic a measure under severe natural handicaps.

"7. It would appear inadvisable to take any measures to protect the existing game and thereby encourage an increase in their numbers. On the other hand, it is inadvisable to permit natives to hunt in the fly districts. The ideal arrangement would be to make the fly districts prohibited areas, and in the region under consideration this is feasible to a far greater extent than would be the case in other parts of the Protectorate."

W. Y.

Clinical and Treatment.

Ringenbach (J.). **Sur un Cas de Maladie du Sommeil chez l'Européen, avec Phénomènes cutanés particuliers.**—*Bull. Soc. Path. Exot.* 1913. Nov. Vol. 6. No. 9. pp. 628-631.

A clinical account of the disease in a European, infected in French Congo, is given with special reference to skin appearances. The patient became ill with violent fever on December 7, 1912. On the same day a button-like swelling appeared on the right shoulder; it was painful on pressure and gave the sensation of an incipient furuncle. The patient had been bitten at this point some days previously by an insect, which he did not see.

In spite of quinine the fever continued until January 1st and the patient wasted rapidly. During January the fever disappeared but reappeared again for 3 or 4 days at the beginning of February. On March 15th the patient observed on each arm over the deltoids a complete ring about 6 cm. in diameter, of a rose colour which did not disappear completely on pressure. At the same time other similar lesions of various sizes appeared on the arms, the chest and the back. These lesions have not disappeared since but, on the contrary, the patient is of opinion that they have increased from day to day; he had attributed their appearance to food poisoning. The only points which caused uneasiness were the progressive emaciation and a general lassitude.

The diagnosis was made at Brazzaville in January 1913. The cervical and epitrochlear glands were slightly enlarged and puncture of the former revealed a few trypanosomes. There was a papular urticarial erythematous rash of a circinate type on the arms, chest, abdomen, shoulders, back, and over the lumbar region. There were 17 circles, complete or incomplete, of a diameter varying from 2 to 11 cm.; the circular band was 5 to 10 mm. broad of a light rose colour with a slightly violet tinge; the colour did not disappear completely on pressure and was accentuated by cold, heat, and sweating and the patient in the last two conditions had a sensation of formication. The lesions protruded slightly, the skin maintained its natural suppleness and there was no desquamation; the rings were sharply defined internally but externally were ill defined and gradually merged with the skin of normal colour.

A brief account of the other symptoms is given. Under the influence of atoxyl the condition of the patient has rapidly improved.

W. Y.

Villaça (Hermenegildo). **Syndromo Ovariano na molestia Carlos Chagas.** [The Ovarian Complications of Chagas' Disease (Parasitic Thyroiditis).]—*Rev. Med. de S. Paulo.* 1913. May 15. Vol. 16. No. 9. pp. 163-168.

It appeared likely to the author that in female patients affected with Chagas's disease the hypertrophy or atrophy of the thyroid would be accompanied by a corresponding diminution or excess of activity in the ovary, the thyroid being the regulator of the activity of many other ductless glands. To test this hypothesis, 56 female patients of all ages were examined, all of whom were suffering from parasitic thyroiditis, and out of this number 25 exhibited decided symptoms of thyroid atrophy combined with excessive ovarian activity, indicated by precocious or profuse menstruation, while 15 showed thyroid enlargement accompanied by tardy or scanty menstruation. In the remaining 16 no correlation between the two functions could be detected.

The author concludes that in parasitic thyroiditis a correlation, in the inverse sense, between the activities of the thyroid and the ovaries can be clearly detected.

W. Y.

Aubert (P.), Monfort (F.), Heckenroth (F.), & Blanchard M.). **Le Salvarsan dans la Prophylaxie et le Traitement de la Trypanosomiase humaine.**—*Bull. Soc. Path. Exot.* 1913. Nov. Vol. 6. No. 9. pp. 632-634.

A number of cases of sleeping sickness in different stages of the disease were treated at Brazzaville with salvarsan. The salt was dissolved in distilled water in the proportion of 10 cgm. per 50 cc. of water. The results of treating 51 cases with doses of this drug, varying from ·5 cgm. to 1·7 cgm. per kilo of body weight in one or more injections, are given in two tables. Twelve escaped and five died in a few weeks without having presented trypanosomes in the blood or glands and before it was possible to judge of the result of the treatment. Twenty relapsed after intervals of from one to 12 months; and fitteen have remained free from relapses, but it is necessary to deduct from this number those in which observation has not been carried on sufficiently long and only to count those which have remained free longer than the case in which relapse was most delayed, that is 12 months. On this basis only one case has been cured by this medicament (no relapse for 16 months).

About 4 months is the average period of sterilization produced by a dose of the drug; this period is definitely prolonged by repetition of the dose. The drug is well borne by the blacks; it always improves the general condition and it is not rare to find a notable increase of weight in spite of the relapses. In two cases however the authors observed syncope with coldness and running pulse after injections of ·5 cgm. and 1 cgm. of the drug per kilo.

The authors compare these results with those of Broden, Rodhain and Corin (see this *Bulletin*, Vol. 1, p. 129). The more favourable results of the latter may be due to the fact that they administered larger doses (2-3 cgm. per kilo) of the drug.

W. Y.

Danysz (J.). **De l'Emploi de quelques Combinaisons medicamenteuses nouvelles dans le Traitement des Trypanosomiases.**—*Compt. Rend. Acad. Sci.* 1913. Oct. 20. Vol. 157. No. 16. pp. 644-646.

The fact that a certain number of micro-organisms become resistant to therapeutic agents has lead to the employment, simultaneously or successively, of several substances. The author has been able to shew that acquired tolerance of certain organisms to bactericidal products varies greatly according to the various substances which are employed as medicaments. Thus it is more easy to obtain resistance against sera, normally bactericidal, and metalloid salts than against alkaloids and above all metallic salts, which are the most powerful antiseptics *in vitro* but of hardly appreciable action *in vivo*. It is a question of a greater or less affinity of the antiseptic for the tissues of the host and for the parasite.

These considerations have induced the author to combine several kinds of active products in order to associate in the same molecule an elective affinity on the one hand and powerful antiseptic action on the other, *e.g.* dyes of benzidine, triphenylmethane or fluoresceine and salts of the metalloids and metals.

In the present paper the author only briefly indicates the results obtained in trypanosomiasis (*T. evansi* and *T. rhodesiense*) with such compounds.

An arseno-silver compound in which the ordinary reactions of silver are masked (the formula is to be published later), was prepared by acting on arsenobenzol with azotate of silver. A single injection of 5 mgm. of this preparation injected intravenously or intramuscularly sterilized the blood of rabbits of 2½ to 3 kilos infected with surra. Mice infected with the same trypanosome were cured by a subcutaneous injection of ·05 mgm. Mice bear 3 mgm. of the product without any appreciable reaction.

T. rhodesiense proved to be more resistant. In mice infected with this parasite it was necessary to inject ·1 mgm. to produce the same results as in the case of surra. On adding however quantities of trypan red, which alone in the same doses is absolutely inactive, one can lower the sterilising dose of the preceding compound by a half, so that mice infected with surra can be cured by ·02 mgm. and those infected with *T. rhodesiense* by ·05 mgm.

Doses of twice and three times the size of silver salts, atoxyl, arsenobenzol and trypan red, when injected separately, have only produced in the same cases slight effects.

W. Y.

Johnston (J. E. L.) & Macfie (J. W. Scott). **Observations on the Action on Trypanosomes of Certain Drugs and of** *Staphylococcus pyogenes*.—*Jl. London School Trop. Med.* 1913. Nov. Vol. 2. Pt. 3. pp. 207-212.

A few experiments were performed to determine the effects of dilute solutions of iodine, bromine and osmic acid on trypanosomes in cover-slip preparations. The results were rather inconclusive. The action of the osmic acid solution was a little more

intense than that of the other two substances, very few living trypanosomes being found in the preparations one hour after the beginning of the experiments.

In the treatment experiments the following solutions were used:—

Iodine.—Tinct. Iodine. ♏ 7, Aq. destil. ad. ʒ 1.

Bromine.—Bromine (2·5 p.c.) ♏ 7, Aq. destil. ad. ʒ 1.

Osmic acid.—Ac. osmic. (2 p.c.) ♏ 12, Aq. destil. ad. ʒ 1.

The trypanosomes employed were *T. vivax* in sheep and *T. lewisi* in rats. The solutions were given intravenously in sheep and subcutaneously in rats. The results were almost entirely of a negative character. Iodine and osmic acid appear to have a very disturbing effect, not only on the trypanosomes, but also unfortunately on the hosts.

The question of the mechanism of the destruction of trypanosomes in the living body is considered. As a result of their observations, the authors are of opinion that trypanophagocytosis occurs, and that large numbers of trypanosomes may be rapidly destroyed by this means.

Three rats infected with *T. lewisi* were treated with a staphylococcus vaccine. Several injections of from two to four million staphylococci were given at various intervals. In one of the animals there was a great reduction in the number of trypanosomes during treatment. The authors state that this might be construed as meaning that the trypanosomes were reduced by the effects of the staphylococcus vaccine to a vanishing point; and that in stopping the vaccine before cure was complete, the trypanosomes returned. However, as the vaccine produced no similar effects on the other two rats, it is probable that the variation in number of trypanosomes seen in the former experiment was merely the normal variation of *T. lewisi* over a prolonged period.

W. Y.

Morphology.

Shilston (A. W.). **Notes on Zululand Trypanosomes.**—*Union of S. Africa Dept. of Agriculture. Second Report of the Director of Veterinary Research.* 1912. Oct. pp. 345-361. With 1 coloured plate and 1 black and white plate.

This paper deals with two trypanosomes found in domestic stock in Zululand. The first of these strains was obtained by inoculating a dog with blood from a sick mule. A detailed description of the parasite is given. It was polymorphic, long free flagellar and short aflagellar varieties being found. The individuals were found to vary in length from 14 to 30 microns, the average being 19 microns. A chart is given showing the percentage distribution in respect of length. It has a general resemblance to that published by Bruce, prepared from slides of the original Zululand *T. brucei*, in that the bulk of the organisms lie between 15 and 20 microns. [The author does not state whether posterior nuclear forms were found although in the coloured plate illustrating the paper two short forms are drawn which approximate to the posterior nuclear forms.] The great variation in the

proportion of long and short forms of the parasite, on different days, is noted. The almost constant appearance of long forms at the beginning of infection led to a suspicion that one might be dealing with a double infection, the short form of trypanosome having a longer period of incubation than the long slender form. To settle this point resort was made to BOURRI's method for isolating trypanosomes, in which a single trypanosome is isolated and inoculated into a laboratory animal. In all cases in which infection occurred both forms of the parasite appeared in the blood, proving that the strain was dimorphic, and not a mixture of two types.

The author compares this strain with the European strain of *T. brucei* (PLIMMER and BRADFORD's). The latter parasite was found to correspond very closely to the description of *T. brucei* given by LAVERAN and MESNIL and others, but it differed in many important respects, notably in the absence of forms below 22 microns in length, from *T. brucei* as described by BRUCE. [This is confirmatory of the observations of STEPHENS and BLACKLOCK (see this *Bulletin*. Vol. 1. p. 662).] The author also examined films of *T. brucei* or *T. pecaudi* from the Soudan. This was very similar to the Zululand trypanosome.

The animal reactions of the Zululand parasite are given in a table. The conclusions are :—

1. That a trypanosome occurs in animals in Zululand which is markedly dimorphic, and in this and other respects closely resembles the trypanosome described by Sir David Bruce and others as *Trypanosoma brucei*.

2. That the trypanosome introduced into Europe in 1896 and described by various authorities as *Trypanosoma brucei*, differs to a marked degree from that described under the same name by Bruce, and from the Zululand trypanosome described above.

3. That a careful study of the trypanosomiasis of Zululand is necessary to determine, among other things, whether a trypanosome having the characters of *T. brucei* as formerly described, also exists in that country.

A brief account is also given of a short aflagellar trypanosome found in blood films of a number of naturally infected cattle and donkeys. This parasite is probably *T. pecorum*.

W. Y.

BLACKLOCK (B.) & YORKE (W.). **The Trypanosome causing Dourine (Mal de Coït or Beschälseuche).** — *Proc. Roy. Soc.* 1913. Oct. 16. Vol. B 87. No. B 593. pp. 89-96. With 1 coloured plate.

The authors refer to the preliminary note published by them, summarised in *Sleeping Sickness Bulletin*, Vol. 4, p. 353, in which they pointed out that whilst examining the strain of *T. equiperdum* in the Runcorn laboratory, short parasites, certain of which exhibited a posterior displacement of the nucleus, were observed. This strain had been preserved at Runcorn since 1907, when it was brought from the Kaiserliches Gesundheitsamt. Fresh animals infected with this strain were obtained from Berlin; their parasites also showed posterior nuclear forms. The authors decided to

examine the various strains of this parasite and were able to collect three:—

Strain A. The Runcorn Laboratory strain. This was brought from Algiers in a horse suffering from dourine by the firm of Hagenbeck.

Strain B. Frankfurt strain, obtained in 1906 from Professor EHRLICH; origin unknown.

Strain C. East Prussian strain, the virus responsible for the East Prussian outbreak of *Beschälseuche* in horses in 1905.

Blacklock and Yorke made a careful study of the morphology of each strain in rats and guinea-pigs. 20,000 individuals of each were examined for the presence or absence of a free flagellum. The results are shown in a table. Whereas of the 20,000 individuals observed 1,321 aflagellar and spicule* forms were encountered in Strain A, only 18 and 86 similar forms were seen in Strains B and C respectively. This distinction was much more clearly brought out by examination of guinea-pigs than of rats. Adopting LAVERAN's scheme for the differentiation of pathogenic trypanosomes (*Sleeping Sickness Bulletin.* Vol. 3. p. 356) Strain A belongs to Group 3, whereas Strains B and C must be put in Group 1. Moreover certain of the short forms of Strain A have a posterior nucleus, whereas in B and C these forms are not found. Careful examination of Strains B and C showed only slight differences. The dimensions of the trypanosomes of each of the three strains, given in a table, are of little assistance. When the curves obtained by plotting out in percentages the various lengths of trypanosomes encountered in each strain are studied, it is found that in the case of rats the curves of each strain correspond fairly closely, but not those of guinea-pigs. The guinea-pig curve of A is that of a dimorphic trypanosome showing two widely separated peaks, whereas the curves of the other strains are curves of monomorphic trypanosomes.

It is pointed out that the species *T. equiperdum* was described by DOFLEIN from the description given by ROUGET in 1896, ROUGET's strain having in the meantime died out. In ROUGET's original paper the account of the morphology of the trypanosome is vague. All subsequent authors agree that *T. equiperdum* is a monomorphic parasite in which all forms are furnished with a free flagellum.

The authors state that "it is important to record that we are unable to distinguish morphologically the parasite of HAGENBECK's dourine horse from *T. rhodesiense*, *T. pecaudi* or *T. ugandae* (*T. brucei*, Uganda)." They hesitate to suggest that it is identical with any of these, in view of the fact that it produced in a horse symptoms clinically known as dourine. They are at present conducting experiments to find out whether these three strains are still capable after numerous passages through laboratory animals of being transmitted in equines by coitus. For the present they give this trypanosome the name *T. equi*.

A. G. B.

* Parasites in which the flagellum is free to the extent of about 1μ or less.

CARPENTER (G. D. H.). **Second Report on the Bionomics of** *Glossina fuscipes* (= *palpalis*) **of Uganda.**—*Reports of the Sleeping Sickness Commission of the Royal Society.* 1913. No. 14. pp. 1-33. With a map and 35 figures.

The first Report was published in No. 12 of the Reports of the Sleeping Sickness Commission and was summarised in Vol. 1, p. 48, of this *Bulletin*. It contained an account of work done up to August, 1911. Until the end of the year the work was continued on Damba Island, and subsequently a year was spent on the largest of the Sesse Islands, Bugalla. The neighbourhood of the latter camp is described, with a sketch map. With respect to the specific name of this fly Carpenter has examined the hypopygia of 60 of the Sesse Island flies and compared the structure with those of flies from the mainland. They all agree exactly, so that this and the former Report deal only with the form described as '*fuscipes*.' The genital armature is figured.

Length of life of the fly.—The marking experiments carried out at Jinja (mainland) between July and October were repeated at Bugalla at a different time of year. The flies were marked by amputation through the tibia or femur of one or other leg; 9,012 flies were so marked and liberated between March 18th and April 26th, 1912. The results are given in a table, which shows the dates of marking, the number of each sex marked, and the number of marked flies, male and female, caught day by day up to February 28th following. None were retaken after January 17th. The table shows that the minimum length of life for a male fly was 247-253 days and for a female 126-131 days.

Influence of Climate.—Climatic conditions are considered to have a marked effect upon the total numbers of the flies, the proportions of the sexes, and the rate of larviposition. This is illustrated by charts. The conclusions are as follows:—

"1. Decreased relative humidity is unfavourable to the adult fly.

"2. Higher temperatures are particularly unfavourable to the female sex.

"3. There is an inverse relation between relative humidity and rate of larviposition."

Carpenter is of opinion that adverse climatic conditions are extremely important, being the main check upon unlimited increase of the fly.

Natural Enemies.—During two and a half years Carpenter has not succeeded in finding any enemies of importance. No parasites were reared from many thousands of pupae. He does not think that this species is devoured by birds. It is out of the way of the larger insectivorous birds of powerful flight which would alone be capable of catching such an active insect. A table gives the results of the examination of the stomach contents of 64 insectivorous birds shot in fly areas; 116 in all have been examined with negative results. He notes that bacilli are nearly always to be found in the fore part of the fore gut both in bred and wild flies; in the Progress Report 19 per cent. was the percentage stated.

Food Supply.—Carpenter has studied the percentage proportion of mammalian (M) and non-mammalian (N) blood at the three localities at which he has worked.

Table IV.

Date.	Locality.	No. of flies examined.	No. of flies in which nature of blood recognisable.	M °/₀	N °/₀
Nov. 7, 1910, to Feb. 10, 1911.	Jinja (mainland).	600	92	31·5 °/₀	68·5 °/₀
Mar. 23, 1911, to Dec. 18, 1911.	Damba Isle	695	177	15·2 °/₀	84·8 °/₀
Jan. 12, 1912, to Jan. 14, 1913.	Bugalla Isle	1,000	246	68·7 °/₀	31·3 °/₀

He explains the excess of M at Bugalla by the great abundance of Speke's tragelaph, which, he states, are more within reach of the fly than on Damba Island. He mentions also hippopotami and otters as a source of mammalian blood and notes that when there are fresh tracks of Varanus, a large monitor lizard, the proportion of N to M on that day is much greater than the average.

Non-mammalian blood might be drawn from birds, reptiles, amphibia, or the lung fish; flies have been seen swarming on Varanus. Carpenter notes that the corpuscles of the lung fish are so enormous that only one at a time could be drawn up the proboscis. He criticises the paper by Bruce, Hamerton, Bateman and Mackie on the Natural Food of *Glossina palpalis* (see *Sleeping Sickness Bulletin*, Vol. 2, p. 245), in which the authors found that of 20 flies 7 had probably fed from a bird and 13 from a reptile or amphibian. He has made careful researches on this point which cannot be given in any detail here. Altogether 46 specimens of red blood corpuscles from tsetse flies were measured; they are arranged in groups in descending order of length of corpuscle. 18 were believed to have come from crocodiles, 25 from Varanus and 2 from cormorants.

Table IX.

Source.	Percentage.	Actual No.	Source.	Percentage.	Actual No.
Avian	4·3	2	Saurian ...	56·8	25
Reptilian ...	95·7	44	—Crocodile...	40·9	18
Amphibian ...	0	0	? Tortoise ..	2·3	1
	100·0	46	—	100·0	44

"It thus appears that reptilian blood is over 20 times more often found in wild flies than avian and that it is probably derived from saurians more often than from crocodiles . . . . . The table embodies the results of examinations of many hundreds of flies."

Fig. 1.

Fig. 2.

Typical sites for collections of pupae.
Both only a few yards from edge of water and a few feet above it.

[Reproduced from the *Reports of the Sleeping Sickness Commission of the Royal Society*, 1913, No. 14, by permission of the Controller of H.M. Stationery Office.]

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Since the first Report the gut contents of 1239 flies have been examined with a view to seeing whether they had fed upon vegetable juices. Numerous bodies of apparently vegetable nature are figured. The discovery of a certain acarine on a proboscis is thought to suggest that the fly had plunged it into a gall. In one fly out of 1,000 examined on Bugalla an Ostracod Crustacean of minute size was found; it might have been sucked up by the fly's proboscis. Carpenter concludes that Glossina does suck up water.

Trypanosomes.—In January 1912 flies were fed on a young monkey at Bugalla. After 7,538 flies had been put on it it showed trypanosomes (March). The monkey was examined about every week till the following February, when it was liberated; it was always in the best of health and spirits; trypanosomes having all the appearance of *T. gambiense* were last seen in December. Further figures are given with regard to the carmine granules which appear to be associated with trypanosomes. A table shows that trypanosomes were found in the gut of flies twice as often at Damba as in Bugalla and at Jinja six times as often.

Table XII gives the sex proportion in three localities.

Table XII.

Locality.	Time.	No. of flies on which result was based.	Female percentage.
Jinja (mainland)	July, 1910, to Feb., 1911 ...	12,773	55·7
Damba Island ...	March, 1911, to Dec., 1911 ...	Over 6,000	21·6
Bugalla Island ...	Jan., 1912, to Feb., 1913 ...	56,675	20·6

With regard to the reason for these differences Carpenter thinks that the percentage of wild female flies seems to depend upon the effect of temperature upon the flies themselves.

Breeding Grounds.—The author is quite convinced that a localised breeding ground is not by any means a necessity. Comparatively few pupae were found on Bugalla, though flies were, if anything, more numerous there than on Damba, where an important breeding ground exists (see former Report). Two pupal sites are figured. The prospects, he writes, of getting rid of Glossina by limiting one's attention to localised breeding grounds are not good. A useful intimation of the site of pupae is often afforded by the pits of a species of ant-lion. It is noted that a live Glossina pupa is much harder to see than an empty shell, owing to the skin being covered by very fine particles of sand or earth.

[A necessarily inadequate account of this interesting paper; readers should procure the original Report which also contains a valuable paper by Dr. Duke, summarised elsewhere in this number.]

A. G. B.

UNCLASSED.

LAVERAN (A.). **Au Sujet des Infections des Souris par le** *Trypanosoma duttoni.—Bull. Soc. Path. Exot.* 1913. Nov. Vol. 6. No. 9. pp. 626-627.

The author received 6 grey mice (*Mus morio*) infected with *Trypanosoma duttoni* in May, 1911, from Senegal. Two of these mice were kept in Paris. One died on March 14, 1913, and the other on July 25, 1913; in other words the infection lasted 22 months in one case and 26 months in the other. The mice appear to have died of old age. Trypanosomes were seen in their blood at all times when examined, the infection being of long duration.

The other *Mus morio* were killed in 1911 for the purpose of inoculating white mice. In the white mice the infection was generally of short duration. In two cases the infection, which was slight, appeared to have died out after 7 and 4 months respectively. Among 8 other white mice the average duration of infection, always slight, was 84 days. The progeny of infected white mice are not immune. In one case a young white mouse was inoculated intraperitoneally when about a month old; the course of the infection was rapid, terminating in death after 34 days.

H. B. Fantham.

PRINGAULT (E.). **Contribution à l'Etude des Trypanosomes de l'Afrique Mineure.**—*Arch. Inst. Pasteur Tunis.* 1913. No. 1-2. pp. 119-120.

The author's intention was to study spirilla in *Vespertilionis kuhli*, but as their blood proved not to contain any, attention was given to the trypanosomes of the bats. Of 109 examined 33 per cent. showed trypanosomes, 15·6 per cent. showing small forms, 17·4 per cent. large forms. The author notes that the percentage of infections surpasses that found by W. L. YAKIMOFF and NINA KOHL-YAKIMOFF (5 per cent.) and that of C. NICOLLE and C. COMTE (22·3 per cent.). The suggestion is put forward that this may be because the examinations were done in the present case during the hot season when the disease may be more widespread. Inoculations into rats and mice of the blood of bats gave negative results, as did also the inoculation of emulsion of bugs suspected of conveying the disease.

T. lewisi.—The author examined 152 rats, *M. Decumanus*, and found 32·2 per cent. infected.

W. Y.

MARTOGLIO (F.). **Sulla Morfologia del** *Trypanosoma cellii.—Ann. d'Igiene Sperimentale.* 1913. Vol. 23. (New Ser.) No. 3. pp. 363-366.

The author refers to a previous paper in which he mentioned three types of trypanosome disease present in Italian Somaliland, the native names of which are "ghindi" or "gol," "gobiat," and "salaf." Ghindi, he states, is transmitted by *Glossina pallidipes*; in the transmission of gobiat importance attaches to

Stomoxys, chiefly *S. nigra* Macq., and possibly research carried out on the spot may prove that *G. pallidipes* takes part in it. Salaf (of dromedaries) is transmitted by Tabanidae, especially Pangonia, *e.g.*, *P. magrettii* and *P. beckeri*.

The author named the trypanosome of gobiat, *T. cellii*, because its pathogenic action on dogs, rabbits, rats and mice appeared to differentiate it from *T. dimorphon*.

In bovines infected with the virus, which was maintained in the laboratory for about three years, forms are found which are quite different from the trypanosome form. These forms comprise (1) irregularly rounded forms presenting active segmentation of the nucleus and blepharoplast, into 2, 4 and 6. Short flagella are seen inside some of these forms. These bodies measure 20 to 25 μ by 10 to 12 μ. (2) Leishmania-like forms with a definite rounded protoplasmic body, and two masses of chromatin, a smaller and a larger. These measure from 2 to 4 μ by 4 to 7 μ to 4 to 8 μ by 9 to 10 μ. (3) Leishmania-like forms are found in the organs, lungs, liver, spleen, bone marrow, more frequently than in the circulating blood, and in the heart muscle sometimes nests of bodies are found containing nucleus and blepharoplast. The author believes these forms are concerned with a second type of schizogony differing from that by binary fission, and supports the view of Doflein that the genus Leishmania should be classified under the family Trypanosomidae.

H. B. F.

Mendeleeff-Goldberg (Polina). **Die Immunitätsfrage bei der Trypanosomenkrankheit der Frösche.**—*Arch. f. Protistenkunde.* 1913. Oct. 10. Vol. 31. No. 2. pp. 241-276. With 2 plates and 9 text-figs.

The author considers that the trypanosomes of *Rana esculenta* and *R. temporaria* are identical. By reason of the production of immune substances in the frog and on account of the adaptability of the parasites, the latter show different appearances in the different organs. Crithidial forms are produced after the reaction against the immune substances. Seasonal differentiation has been seen neither in the large vegetative nor in the small, cultural forms. The trypanosomes only multiply when the immunity of the frog dwindles, as under conditions of high temperature or hunger. Infected frog blood can kill and dissolve trypanosomes. Inactivated frog blood kept for half an hour at 60° C. loses its defensive immunity products. Fresh guinea-pig serum then added to it will make it active again. The immunity product is of the nature of an amboceptor. The life cycle of the frog trypanosome is simple. Trypanosomes from the frog pass into the intermediate host and then at the time of metamorphosis are transmitted to the tadpole.

H. B. F.

Ogawa (M.). **Sur un Trypanosome de** *Triton pyrrhogaster.*—*Compt. Rend. Soc. Biol.* 1913. Oct. 24. Vol. 75. No. 29. pp. 268-271. With 18 text-figs.

The trypanosome was found in *Triton pyrrhogaster* in South Japan. The host is a tailed Amphibian, in which group trypanosomes have only once been found before. In the flagellate stage the organism is large, 57·6 μ to 80·8 μ in body length. The aflagellar end is pointed.

The trypanosome has been cultivated on the Novy-MacNeal medium, and on blood-bouillon. Crithidial forms occur in the cultures on the third day and increase in number for a month. Leishmania forms, about 6 μ in diameter, appear at the beginning of culture. Crithidial forms in the cultures on blood-bouillon are sometimes very long. Old cultures on blood-agar, from twelve days old, show rounded forms without free flagella. These may be vacuolated and multinucleate, with several blepharoplasts. The spherical nucleus of cultural forms exhibits a distinct nuclear membrane with about 8 chromatin masses abutting on it, and a karyosome.

The trypanosome shows differences of size from the only other known Urodele trypanosome, *T. diemyctuli,* and therefore is considered a new species, *T. tritonis.*

H. B. F.

MALARIA.

FALCIONI (Domenico). **Osservazioni Epidemiologiche, Profilattiche e Curative fatte durante la Campagna Antimalarica 1911.** [Epidemiological, Prophylactic and Therapeutic Observations made during the Antimalarial Campaign of 1911.]—From vol. "*In Onore del Prof. Angelo Celli, nel* 25 *Anno di Insegnamento.* 1913. pp. 305-323. [Turin: Unione Tip.-Editrice Torinese.]

The author, as medical officer to one of the most malarious of the suburbs of Rome, gives an account of his experiences, though he has not very much that is novel to record. Like the majority of Italian sanitary officers occupied with similar duties, he has a good deal of complaint to make with regard to the unwillingness of the Italian labourer to take his prophylactic dose of quinine regularly, when working in a malarious locality. The efforts of the Italian Government to colonize its insalubrious districts are thus in great measure frustrated. Seasonal workers are particularly troublesome in this respect, and carry away the infection to their homes, there to develop it at leisure. To delay colonization until the last pool is drained and the last mosquito is exterminated does not seem possible.

The effect of hard work and privation in predisposing to relapses is very marked in the author's district. The rate of malarial sickness goes up in the spring long before the mosquitoes become plentiful, owing to the resumption of field-work in the month of April; and the lack of apparent connexion between the prevalence of malaria and the number of mosquitoes might be difficult to explain if enquiry did not show that all the cases occurring give a history of previous infection.

A. Balfour.

MARTELLI (Pier Nello). **La Campagna Antimalarica ad Alberese (Grosseto) nel 1912.** — *Propaganda Antimalarica.* 1913. Aug. 31. Vol. 6. No. 4. pp. 81-92.

Of late years the Italian Government has made serious efforts to reclaim the large tract of land known as the Tuscan Maremma, through which the railway line from Pisa to Rome passes. The principal town of this district is Grosseto. During the malarious season the Government stations a special medical officer at Alborese, within the reclaimed area, to watch over the health of the inhabitants; and in the present paper the author gives an account of his experiences in that capacity during the summer and autumn of 1912.

About 17,000 acres of marshland have been brought into cultivation under the Government scheme of operations, and there are now about 220 persons settled permanently on this area of land in Government-built houses with suitable out-buildings. In addition about double this number of immigrants enter the district every year, in the summer as harvesters, and in the

winter as woodcutters and workers on building and drainage operations. For the latter class the accommodation provided is much less suitable, consisting of barns and other buildings with hammocks for sleeping purposes provided by the authorities. It is difficult to exercise any personal supervision over this latter class of workers, and, though they are all furnished with quinine, they will not, as a rule, trouble to take it as a daily prophylactic, so that the amount of malarial disease met with is considerable, and apparently of a severe type. Doses of from one to two grammes of quinine are necessary to subdue the access of the fever, and a continuance of a daily dose of a gramme for 15 to 20 days is necessary to prevent a recurrence. Of the children in the district, nearly one-half came under the author's care for attacks of malaria.

In spite of the obstacles presented by the indolence and ignorance of the Italian peasant, the author thinks that the progress made with the scheme of reclamation is remarkably good. He would, however, like to see the importation of casual labour from a distance stopped altogether, as these immigrants can with difficulty be brought to see the necessity for complying with anti-malarial precautions, and their conditions of feeding and lodging, as a rule, leave much to be desired.

A. B.

Howe (W. B. W.). **The Propagation of Tertian Malaria in the Mountains of North Carolina, Henderson County in Particular.** —*Southern Med. Jl.* 1913. Nov. Vol. 6. No. 11. pp. 732-733.

The author shows that benign tertian malaria exists in the mountains of North Carolina at 2200 feet and is associated with the presence of *Anopheles crucians* and *A. punctipennis*. The former is known to transmit the disease.

A. B.

Henson (Graham E.). **Malaria: Etiology, Pathology, Diagnosis, Prophylaxis and Treatment. (With an Introduction by Charles C. Bass.)**—190 pp. With 27 text illustrations and 1 coloured plate. 1913. London: Henry Kimpton. Glasgow: Alexander Stenhouse. [10*s*. 6*d*. net.]

A review of this book appears on pp. 59-61.

Clinical.

Patterson (J. F.). **The Cerebral Form of Pernicious Malaria.**—*Jl. Amer. Med. Assoc.* 1913. Nov. 15. Vol. 61. No. 20. pp. 1807-1809.

The cerebral form of pernicious malaria may simulate any organic disease of the brain and sometimes the resemblance is so close that a blood examination alone will establish the diagnosis. The author recognises the following types of cerebral malaria (1) comatose; (2) motor irritative; (3) motor depressive. He

describes them in some detail, the first being the most frequent and being characterised by fibrillary twitching of the muscles of the extremities along with the usual symptoms of coma. If diaphoresis and recovery do not occur, the coma deepens and death results, usually from pulmonary oedema. The motor irritative type presents symptoms varying from mere muscle twitching to clonic convulsions. It may simulate uraemia, hysteria or tetanus. The motor depressive form is very rare. Indeed LANDOUZY could only collect twelve cases in all the literature. There is paralysis of the monoplegic, paraplegic or hemiplegic type, the paralysis generally commencing and subsiding with the malarial paroxysm. Interesting cases illustrative of all the three types of cerebral malaria are described, and the author also quotes certain records showing that patients admitted to hospital as insane were found to be suffering from cerebral malaria. He mentions a case of this kind which came under his own observation and where the symptoms of confusion lasted more than two months.

A. B.

RUBINO (Gaetano). **Un Caso di Perniciosa Malarica a Sindrome Meningitica con Linfocitosi del Liquido Cerebro-spinale.**—*Rivista Ospedaliera.* 1913. July 31. Vol. 3. No. 14. pp. 610-611.

A child, nine years old, was admitted to hospital. Eight days previously it had been attacked with abdominal pains and diarrhoea, accompanied by fever. The temperature continued high with only partial remissions. On admission the case appeared grave, with sensibility blunted, rigid back and retracted head. The pupils were unequal, the pulse 160 per minute and the temperature 38·8° C. Owing to the rigidity of the abdomen, the examination of the abdominal organs was unsatisfactory, and on account of the general hyperaesthesia, retracted head and exaggerated reflexes, meningitis was diagnosed and a lumbar puncture performed. The fluid removed contained 0·5 gramme per mille of albumen, and showed numerous lymphocytes in the sediment. A second puncture gave similar results. No special treatment was therefore adopted, and the child died three days afterwards in clonic convulsions.

Towards the end, on account of the rapid aggravation of the symptoms, the blood was examined, when aestivo-autumnal parasites were found in abundance. Quinine was then given, but too late. Post-mortem, the liver and spleen were found to be distinctly enlarged, while the meninges showed only extreme congestion.

The case is cited to confirm the observation of PENDE who found lymphocytosis of the cerebro-spinal fluid in two cases out of five of pernicious malarial fever, but it is instructive also from another point of view.

A. B.

SERGENT (Edm. & Et.), BÉGUET (M.), & PLANTIER (A.). **Observations microscopiques au Cours d'un Accès pernicieux paludéen.**—*Bull. Soc. Path. Exot.* 1913. Nov. Vol. 6. No. 9. pp. 615-617. With 1 coloured plate.

The authors describe certain appearances seen in the blood of a native (? Algerian) child, three years of age, whom they found in a state of coma as the result of an attack of pernicious malaria. These appearances they class as (1) lesions of the parasite-containing red cells, (2) peculiar elongated forms of the young parasites. A coloured plate illustrates both conditions.

1. The authors recall the earlier work of the brothers Sergent on the so-called *corps en pessaire.* The lesions they now describe resemble in some measure these "pessary bodies" but are formed in a different manner. They occur only in the infected erythrocytes and are in the form of red rings usually exactly coinciding with the outlines of the red cells, *i.e.* each corpuscle looks as though it were surrounded by a red ring which has the appearance of possessing a double contour. This distinguishes them from somewhat similar forms observed by BILLET. Occasionally the red ring is situated well within the red cell being separated from the margin of the latter by a circular band of corpuscular substance.

2. The elongated young parasites present different shapes, but are best described as streaks of blue-staining protoplasm and of chromatin which, occasionally, are thrown into the form of loops or irregular rings. They resemble the young schizonts often seen in quartan infections and were noted by ZIEMANN in 1906.

[These elongated, young forms of *P. falciparum* have been seen every now and again in the Anglo-Egyptian Sudan. They do not seem to have any special significance but are apt to be mistaken for young quartan parasites. A suitable name in English for the above-mentioned corpuscular lesions would appear to be "ringed red cells."]

A. B.

PEPE (T.). **Febbri Comitate.** [Complicated Fevers.]—*Gaz. d. Ospedali e d. Cliniche.* 1913. Sept. 21. Vol. 34. No. 113. pp. 1175-1176.

A brief account of four cases of atypical malarial fever occurring in the writer's practice, in which the true cause of the affection would probably have been overlooked if it had not been for the systematic examination of the blood for parasites. The first case was that of an elderly man who presented the clinical signs of left-sided croupous pneumonia, along with an enlarged liver and spleen. The case was treated with quinine. Within 24 hours the patient was sitting up in bed with a normal temperature. The lung-symptoms however re-appeared within the following 24 hours, but were again subdued by the same means. The second case was that of a young man who was found in bed in a state of algid collapse with vomiting and diarrhoea. In this case also liver and spleen were perceptibly enlarged. A hypodermic injection of quinine was given, and the patient

recovered. The blood showed parasites. In the third case, that of a child, aged eight years, the patient was brought to the writer because of an alarming swelling of the left eye, which accompanied an intermittent attack of fever and sweating of tertian type. A much enlarged spleen was detected, and the blood, upon examination, showed parasites. Sufficient dosage with quinine and a cold lotion to the eye got rid of all symptoms very quickly. The last case was that of a man who had been suffering from attacks of malaria which had yielded to quinine, and who, while walking in the street, was seized with right-sided paralysis. He was taken into a house, and remained unconscious for four days. Every other day he had a rigor and fever. The examination of the blood for parasites gave a positive result, and quinine was administered. The fever then disappeared and the hemiplegia began to improve, so that at the end of two months no trace of paralysis remained. The author therefore diagnosed cerebral thrombosis due to parasites. The four cases are narrated with a view of laying stress on the necessity of invariably examining the blood in cases of sudden illness, in a malarial locality.

A. B.

FRAGA (Ch.). **Le Foie dans le Paludisme Chronique (Etude de son Etat physique et fonctionnel).**—*Rev. de Méd.* 1913. Oct. 10. Vol. 33. No. 10. pp. 816-828.

This is a paper from Brazil, read before the Tropical Medicine Section of the International Congress of Medicine. The author's views are sufficiently indicated in his list of conclusions which are as follows:—

1. Chronic malaria does not induce grave changes in the liver. The alterations produced are usually fleeting, slight and curable by ordinary means.
2. As a rule physical examination reveals no change but sometimes it is possible to make out an increase in size of the liver, which may be tender on palpation.
3. The physical examination is wholly confirmed by the usual tests for functional activity.
4. Serious liver trouble in chronic malaria is due to concomitant causes, more especially alcoholism and insufficient nourishment.

An account of eight cases is given in confirmation of these views.

A. B.

TISSIER & BRUMPT. **A propos d'un Cas de Paludisme congénital.**—*Arch. Mensuelles d'Obstétr. et de Gynécol.* 1913. Feb. Vol. 2. No. 2. pp. 166-174. With 3 text-figs.

According to the authors there have been hitherto only two well authenticated and undoubted cases of congenital malaria recorded. Both occurred in Algiers and were due respectively to infection with *P. falciparum* and *P. malariae*. They now record very fully and carefully a third case in which the infection was of the benign tertian type, *P. vivax* being found in the peripheral blood of both mother and child. The former acquired

malaria in Algiers at the beginning of her sixth pregnancy. Later she left Africa and resided constantly at Neuilly, a Parisian suburb, suffering frequently from malarial paroxysms. She was treated with quinine and arsenic and eventually was safely delivered of a male child. Unfortunately, in the anxiety regarding the case the blood of the umbilical cord was not examined. Neither was that of the placenta. The child appeared healthy but on the 19th day suffered from convulsive movements and an attack of fever, which lasted about three hours. The fever recurred and eventually the mother herself noticed the similarity of the child's attacks to those from which she used to suffer. At a later date the child's blood was examined and, as stated, *P. vivax* was found. It was also present in the mother's blood on the same date. The authors believe that the case was an example of true infection *in utero* and not of inoculation of the infant's blood at the time of birth as a result of placental laceration. They regard the long incubation period as against the latter view. Any question of the child's being infected in the natural way at Neuilly may be put out of account. A description of the blood findings both in the mother and child is given and the so-called panoptic staining method of Pappenheim is given in detail as a foot-note.

Charts show the child's temperature and its increase in weight under successful intramuscular injections of quinine hydrochloride.

A. B.

Heiser (Victor G.). **Malaria in the Newborn.** [Correspondence.] —*Med. Record.* 1913. Nov. 8. Vol. 84. No. 19. p. 855.

The author, who is Director of Health for the Philippine Islands, recognising the desirability of collecting data regarding the question of maternal transmission of malaria records the following case:—

"A child, Filipino, born January 2, 1913, at the Iwahig Penal Colony in Palawan, on January 7 had a rise in temperature and symptoms which led to the suspicion that it might be infected with malaria. Examination of the blood made on January 9 showed distinct malarial crescents. The mother had suffered from estivoautumnal infection at intervals during her pregnancy. For a number of months prior to December 25 she had been actively treated with daily gram doses of quinine sulphate given in capsules by the mouth."

A. B.

Treatment.

Grothusen. **Ein Beitrag zur Behandlung der Malaria.** [A Contribution to the Treatment of Malaria.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1913. Nov. Vol. 17. No. 22. pp. 783-785.

The author, writing from German East Africa, states that as a result of his experience there he has been led to discard giving quinine by the mouth and now employs intramuscular injection. He finds the latter method preferable because:—1. The quinine

is better absorbed and acts better, especially during the febrile paroxysm. 2. It is pleasanter for the patient. 3. It is of advantage to the physician with regard to dosage, &c.

He discusses the question under these three headings, pointing out that he employs the bimuriate of quinine in daily doses of half a gramme injected not into the buttocks but into the biceps of the upper arm. Provided one is careful to avoid going too close to the anterior, radial border of the muscle there is no danger of injuring the anterior circumflex artery or the cephalic vein. Grothusen has given many hundreds of successful injections in this manner. The natives prefer the injection to quinine by the mouth. In fact the method is so popular that men who have been treated bring their wives and children to be injected.

An account of four cases successfully treated by this means concludes the paper.

A. B.

PARROT (L. M.). **Sur l'Administration des Sels de Quinine en Médecine infantile.**—*Rev. de Méd. et Hyg. Trop.* 1913. Vol. 10. No. 2. pp. 89-92.

The author thinks that the treatment of malaria in children, at least as regards the dosage and method of administration of the quinine salts, is a subject which is either poorly or insufficiently considered in the classical works on malaria. He believes that an account of his personal experiences on this matter may be useful. Taking up first the question of posology he recalls the maxim of COMBY to the effect that children are very tolerant of quinine. In ordinary cases he is accustomed to give ten centigrams of a quinine salt for each year of the child's age, administering it, if by injection, in a single dose daily, if by the mouth, in divided doses two or three times in 24 hours. In severe cases there need be no hesitation in doubling the dose.

The following table shows his method of procedure in such cases:—

From 3 months to 1 year ...	0·15 gm.	to	0·25 gm.	per diem.
From 1 year to 3 years ...	0·25 ,,	,,	0·40 ,,	,,
From 3 years to 5 years ...	0·40 ,,	,,	0·50 ,,	,,
From 5 years to 10 years ...	0·50 ,,	,,	0·60 ,,	,,

As the tasteless salts are less active than those which are bitter he gives the former in doses of 20 centigrammes for each year of age.

Turning to methods of administration, he mentions rectal injections and the use of quinine inunctions only to dismiss them. The difficulties of giving quinine by the mouth in the case of children may be surmounted by administering the tasteless salts or by concealing the taste of the bitter preparations. The latter method fails in children over 4 years of age who readily detect the fraud whether sugar or chocolate is employed as the covering agent. Hence tasteless preparations, such as euquinine or aristochine, are better for general use. They may be given in suspension in water, milk, &c., but the author specially recommends pastilles or other chocolate preparations of aristochine. Pastilles, however, should

not be followed by an acidulated drink as the latter will decompose any aristochine remaining in the mouth. They should be washed down by a glass of pure water or better an alkaline water.

Provided the quinine be given intramuscularly the author regards injection as the method of choice. Strict asepsis and sufficient dilution, *i.e.*, 0·25 gm. of the salt to 1 c.c. are required. The injections should be made in the buttock and the author gives directions as to the best method of carrying these out in the case of infants and small children. He employs the bihydrochlorate or the chlorhydro-sulphate in a solution of 1 to 4 in distilled water and warns against the use of so-called quinine serum or isotonic quinine which contains chloride of sodium.

M. Granjux in criticising this paper considered the dose recommended by the author as erring a little on the large side in the case of children under three years. For infants at the breast quinine may be given to the mother.

A. B.

Cutter (John Ashburton). **Neosalvarsan and Malaria: A Personal Experience.**—*New York Med. Jl.* 1913. Nov. 1. Vol. 98. No. 18. [Whole No. 1822.] pp. 864-865.

The author got his first attack of malaria in 1888. From this he apparently completely recovered and was infected afresh in 1898. From this date he has continued a victim to the disease and apparently acquired a new infection in 1912. In the following year, being still far from well despite large doses of quinine, he was treated with neosalvarsan. It produced unpleasant symptoms such as pain in the chest and intestinal colic but appeared to benefit his general condition. The author admits that he does not know how thoroughly cured he is but evidently pins his faith to neosalvarsan.

[Unfortunately what might have been an interesting and instructive paper is spoiled by the way in which it is written and by the omission of any account of certain necessary observations. Beyond a casual note to the effect that plasmodia were not present in the blood there is no account of the haematological findings. The type of infection is not stated, there is no record of differential leucocyte counts, the condition of the blood is not described. Further the urobilin test was apparently not applied, and though the author states his intention of making his presentation as clinically complete as possible we learn nothing of the actual state of his spleen, liver or kidneys. Apparently the neosalvarsan was given straight away without any careful examination of the patient who may be congratulated on escaping alive! It seems a pity that a medical man should have allowed himself to be treated throughout in what was apparently a very haphazard and careless manner and one from which no definite conclusions can be drawn.]

Dr. Ayres reports another case of chronic malaria [? type] in which neosalvarsan, 0·9 grammes, given on two occasions served to effect a cure.

A. B.

SHEARD, Jr. (Charles). **A Case of Malaria treated with Neosalvarsan.**—*Canadian Practitioner & Review.* 1913. Oct. Vol. 38. No. 10. pp. 588-591.

An account of a case of benign tertian malaria which was greatly benefited, if not wholly cured, by a single dose of neosalvarsan. Infection was apparently acquired in one of the New England States and the neosalvarsan in a dose of 0·9 gm. was given intravenously six hours before the next rise of temperature was due. The latter did not occur, parasites disappeared from the blood, and the patient remained to all appearance perfectly well up to the time [period not stated] of his discharge from hospital.

A. B.

FONTOYNONT & RAZAFIMPANILO. **Du Traitement du Paludisme par l'Hectine.**—*Rev. de Méd. et Hyg. Trop.* 1913. Vol. 10. No. 2. pp. 77-81.

In Madagascar the authors have obtained excellent results in treating malaria by the use of Hectine [the sodium salt of Benzo-sulpho-p-aminophenylarsonate]. Its action resembles that of the cacodylates and of di-sodium methylarsinate [arrhenal]. The cures which it effects appear to be more lasting than those obtained by the use of arrhenal.

Hectine is valuable in cases where quinine is contra-indicated. It may also be given instead of quinine and, still better, in association with it. It is administered in intramuscular injection in doses of 10 and sometimes of 20 centigrams. From a study of the blood of their malarial cases the authors conclude that—

1. Hectine may be given in all cases of malaria save in pernicious attacks, where a rapid action is required and quinine is the sheet anchor.
2. In cases where there is a leucopenia or even a hypoleucocytosis, and such cases are frequently seen in severe malaria in Madagascar and elsewhere, hectine will succeed where quinine fails to destroy the parasites.
3. In such cases it is advisable to give 3 or 4 injections of hectine, then to resort to quinine injections, and then, abandoning these, to complete the cure by means of hectine, arrhenal or quinquina powder.

Hectine has a marked beneficial effect on the general state of the patient and is usually well borne, though occasionally the injections seem to cause some pain. The histories of eight cases of malaria in natives treated with hectine are given in proof of the above statements.

In a discussion on this paper, while the efficiency of hectine was confirmed, it was stated that the results are apt to be uncertain, especially in the case of children.

A. B.

MCCULLOCH (H. D.). **Irradiation of the Spleen in Malaria and Other Affections.**—*Med. World.* 1913. Oct. 9. Vol. 1. No. 10. pp. 370-371.

After reference to a paper by MANONKHINE of St. Petersburg on leucocytolysis, to previous work of his own on the same subject, and

to earlier personal experiences on X-ray therapy in chronic malarial splenitis, the author gives abstracts from a paper by SKINNER and CARSON on the successful treatment of enlarged malarial spleen by irradiation. Five cases of febrile malaria are there recorded and it is stated that the application of X-rays in cases of malarial fever relieves splenic pain and reduces recent engorgement, that the temperature falls and does not usually rise again, and that recovery is not attended by the anaemia usually present in cases treated with quinine. Further, cases resistant to quinine have yielded promptly to the rays. Cases of *chronic* splenic induration in natives were under treatment, but, so far, no definite statement could be made regarding them. Reference is made to three cases of splenic and hepatic hypertrophy in Englishmen submitted to X-ray therapy by the author in 1907-08 with very gratifying results.

He concludes his paper by stating his theory as regards the action of X-rays. He regards them as what is termed a "fourth state of matter," a most potent molecular agency which influences cells according to their individual molecular complexity and their relative instability.

A. B.

QUÉNU & DEGRAIS. **Splénomégalie d'Origine paludique traitée avec Succès par le Radium.**—*Bulls. et Méms. Soc. de Chirurgie de Paris.* 1913. Nov. 18. Vol. 39. No. 34. pp. 1449-1451.

A case of marked chronic malarial splenomegaly in a Frenchman resident in Cochin-China was treated with most gratifying results by the exposure of the splenic tumours to radium emanations. Particulars of the treatment are given. The applications caused some cutaneous irritation and a little pain, but effected a rapid reduction in the size of the spleen and between May 3rd and June 28th altered the character of the differential leucocyte count. The authors remark that they are aware that radium treatment has not always succeeded in similar cases but they were much gratified by its effects in the present instance.

[Although there seems little doubt that the splenomegaly was of malarial origin it is worth noting that parasites were not found in the peripheral blood.]

A. B.

PROPHYLAXIS.

RUGE. **Schwierigkeiten bei der Chininprophylaxe.** [Difficulties in Quinine Prophylaxis.]—*Jl. State Med.* 1913. Sept. Vol. 21. No. 9. pp. 564-567.

The author cites numerous examples showing how the efficacy of quinine prophylaxis varies in different countries, under different conditions of administrations and amongst different classes of the community, as, for example, the individual European civilian in the tropics and European troops under medical control and supervision. This variation has tended in some measure to bring quinine prophylaxis into disrepute and Ruge's paper is useful in directing attention to the factors on which it depends and showing that the prophylaxis must be adapted to

circumstances and to environment if the best results are to be achieved. It is, of course, essential in all cases of quinine prophylaxis that the drug be given regularly and in a form which ensures proper absorption but, even when this is done, the method sometimes fails for reasons of which we are still ignorant. As SERGENT has pointed out, the good-will and co-operation of all concerned are essential if quinine prophylaxis is to be successful. The author remarks that these are best secured by taking care that the type of prophylaxis employed is not of a nature to cause severe or unpleasant effects. In order to gain a proper understanding of the difficulties which, at the present time, beset the question of quinine prophylaxis he proposes—

1. That in the tropics the method of ZIEMANN and NOCHT be employed, *i.e.* one gramme of quinine every fourth day, given in doses of 0·25 gramme.

2. That an enquiry be instituted to test the efficacy of the method where small daily doses of quinine 0·25 to 0·3 grammes or, if desired, 0·2 grammes daily, morning and evening, are given with the exception of two consecutive days in the week, say Saturday and Sunday. No quinine is to be taken on those days.

3. That deductions should only be drawn when the prophylaxis has been carried out under medical supervision and in the case of persons who have not previously suffered from malaria.

4. That the necessity for varying the type of prophylaxis according to the locality be kept in mind.

A. B.

MOREAU (Laurent). **Prophylaxie du Paludisme dans l'Afrique Orientale Allemande.**—*Bull. Soc. Path. Exot.* 1913. Oct. Vol. 6. No. 8. pp. 561-571.

An account of the means taken to combat malaria in German East Africa during the last twelve years.

At the time the railway was constructed from Dar-es-Salam to Tabora the disease claimed many victims but the engineering works carried out, and especially the drainage of swamps, have been productive of benefit. Petrolage has not proved very efficacious and experiments with larvivorous fish are now being conducted. It is, however, individual prophylaxis which claims the greatest attention.

In addition to the taking of quinine there is a very elaborate system of mechanical protection, but the special feature of the German system is the application of the principles of individual prophylaxis to the native community, in other words to the chief "carriers" of the disease.

Systematic weekly examinations are made of the blood of all those inhabiting the native quarters in Dar-es-Salam, and presumably elsewhere, and anyone found harbouring malarial parasites has to undergo an intensive quinine treatment whether or not he is suffering from fever. The village is divided into sections for convenience of inspection and in such a way as to prevent individuals being overlooked or escaping the examination.

It is recognised that the itinerant native is even more dangerous than the stay-at-home one, as members of caravans

visit endemic centres of malaria and act as distributors of the disease. Hence caravans have their police and blood examinations are practised all along the routes which they follow.

These methods were advised a dozen years ago by Koch and Olwig and, while the author states that one must not draw conclusions at too early a period, it would seem that already they have been followed by gratifying results.

Thus the mortality amongst natives which was about 50 per cent. has considerably diminished, coincidently with the disappearance of the plasmodia from the blood. Cases of malaria in Europeans have fallen from 40 per cent. to 10 or 15 per cent. and no longer exhibit the severity seen in former days. Blackwater fever and pernicious forms of malaria are now only observed at long intervals.

The author pays a tribute to the spirit and devotion of the numerous official personnel which has accomplished so much good and thorough work.

[There can be no doubt that in the past the efficient treatment of the human "carrier" has not received the attention it deserves. It is usually very difficult to carry out properly amongst native communities and one would have been glad of more detailed information regarding the intensive quinine treatment which has apparently been so successfully employed in German East Africa.]

A. B.

Thompson (H. N.). **The Prophylactic Use of Quinine.**—*Jl. R. Army Med. Corps.* 1913. Nov. Vol. 21. No. 5. pp. 587-589.

As a result of experimental work in the case of British troops at Lucknow in 1910 and 1911 the author has come to the conclusion that quinine prophylaxis is useless and may even be harmful. [As in the first series of experiments the dose was manifestly inadequate and as there is nothing to show in what form quinine was used and that precautions were taken to see that it was properly *absorbed*, the paper does not call for detailed notice. It would be well for anyone reading it to consult at the same time that by Engeland (see this *Bulletin*, Vol. 2, p. 337), and the article by Ruge (see above).]

A. B.

Cultivation.

Sergent (Edm. & Et.), Béguet (M.), & Plantier (A.). **Sur la Culture *in vitro* du Parasite du Paludisme, d'après la Méthode de Bass.**—*Compt. Rend. Soc. Biol.* 1913. Oct. 31. Vol. 75. No. 30. pp. 324-326.

Yet another contribution to the rapidly increasing literature on this subject. The three cases which yielded the parasites for the experiment were all malignant tertian. One only had been given quinine prior to the blood being taken. In each instance some development took place. In the case where quinine had been administered the complete evolution of one generation of *P. praecox*

[*Laverania malariae*] from small rings to merozoites was traced. In one of the other cases a further stage was reached and the infection of red cells by a new brood of very young parasites was observed. The authors believe that for successful culture the temperature must be above 37° C. [See, however, review of paper by J. G. and D. Thomson in this *Bulletin*, Vol. 2, pp. 554-556.] In the tubes, when evolution ceases, the parasites are destroyed either by phagocytosis or by a spontaneous degeneration, the changes resembling those seen in plasmodia killed by quinine.

Crescents become elliptical and remain for a long time without showing any signs of parthenogenesis. The authors excluded the source of error mentioned by Da Rocha-Lima and Werner (see this *Bulletin*, Vol. 2, p. 340), *i.e.* mistaking a mere persistence of unchanged young forms for young parasites of a new generation.

A. B.

Ross (G. A. Park). **A Fictitious Native Disease (Isigwebedhla).**—*Ann. Trop. Med. & Parasit.* 1913. Nov. 7. Vol. 7. No. 3 B. pp. 371-376.

The author has found that the disease called in Zululand Isigwebedhla is merely an advanced stage of tropical malaria. He believes it has been exploited and its symptoms exaggerated by native doctors, more especially the Tongas, to serve their own ends. The nature of the deception is described and the paper is rather out of the common and of considerable interest having notes on native methods of diagnosis and treatment.

A. B.

Book Reviews.

Henson (Graham E.). **Malaria: Etiology, Pathology, Diagnosis, Prophylaxis and Treatment. (With an introduction by Charles C. Bass.)**—190 pp. With 27 text illustrations and 1 coloured plate. 1913. London: Henry Kimpton. Glasgow: Alexander Stenhouse. [10*s.* 6*d.* net.]

This is undoubtedly a useful book. It is of a convenient size; it is well arranged; for the most part it is clearly and carefully written; the majority of the illustrations are good and it is well up-to-date.

On the other hand, while there are few errors, there are some notable omissions which, it is hoped, will be made good in a future edition.

The brief historical account with which it opens leaves little to be desired, but there is no allusion to the pioneer work of Beauperthuy. For a work of this type, the notes on geographical distribution may be deemed sufficient. Some interesting figures are given as regards the economic loss which malaria has caused in Italy, India and the United States. In the case of the last named, Howard has estimated that malaria costs the country the enormous sum of one hundred million dollars annually.

Turning now to etiology, we find the author adopts Craig's classification of the species of plasmodia and admits a quotidian variety of *P. falciparum*. He also accepts the view advanced by Schaudinn and upheld by Craig as to gametes being derived from the ordinary sporulating forms through some action on the part of the human host and not from any separate class of sporozoites. This chapter (No. 2) is one of the best in the book. On p. 43, there is a useful table showing the chief differences between the four species of plasmodia described. A second table, setting

forth the characteristics of the different young or ring forms, might with advantage have been included. In this connection it may be noted that while the photomicrographs taken from CRAIG's work are excellent, the same cannot be said of Figs. 1 & 9. Again, the coloured plate of the cycle in man and the mosquito might have been better.

Chapter 3 deals with the mosquito carrier. It gives the impression that it has been written chiefly for workers in the New World and it is certainly strange that there are no illustrations of anopheline eggs, larvae or pupae. The development of the plasmodia in the mosquito is taken verbatim from CRAIG. Chapter 4 considers the predisposing factors in the etiology of the disease. The author believes congenital malaria does not occur though he admits the question is still *sub judice*. He attributes the fever to the liberation of a toxin but makes no mention of the possible rôle played by the pigment, haematin (Wade H. BROWN). The question of the human carrier is considered and more especially of heavily infected gamete carriers, and on page 68 the author cites an interesting example of the part which such carriers may play in ensuring the persistence of endemic malaria.

The section on the cultivation of malarial plasmodia is a recapitulation of the work by BASS & JOHNS.

The chapter on pathology, complications, sequelae and prognosis is concise and useful. It is a pity, however, that the author follows CRAIG in his classification of leucocytes. It is, the reviewer thinks, essential that the true large mononuclear cell, often a pigment bearer, should be clearly distinguished from the large lymphocyte. It is gratifying to note that the author lays stress on the importance of recognising the co-existence of malaria and ankylostomiasis. As regards sequelae his remarks on nephritis are worthy of attention. The effect of repeated attacks of malaria on the kidneys is apt to be forgotten.

The chapter on diagnosis is well done and the author's condemnation of the therapeutic test deserves attention. On pages 105-6 will be found his modification of the thick film method of JAMES. It is said to save time and to give good results. The few pages devoted to differential diagnosis will repay perusal. Elsewhere the occurrence of abdominal pain in tropical malaria receives well-merited notice and the gastric type of pernicious malaria is mentioned, but on page 107 there is an interesting account of a case of benign tertian malaria simulating appendicitis. The masking of malaria infection by abdominal symptoms is one which must not be ignored and is also one with which our British text books have hitherto failed to deal adequately. It is perhaps on the clinical side that the work under review comes most into prominence. The chapter on latency is not very satisfying, though as regards the etiology of malarial recurrence the author adopts the view of ROSS which is now generally accepted, *i.e.*, asexual reproduction by schizogony. His account of the literature on parthenogenesis is, however, incomplete and he attributes more importance to CRAIG's observations on intracorpuscular conjugation than perhaps they deserve. One would here ask, as one has asked before, why has this phenomenon only been observed by American investigators? As regards prophylaxis Henson is in favour of the method of taking 5 grains of quinine daily. Under the chemical means of dealing with mosquitoes there should have been some mention of fumigation with cresyl and the use of the Giemsa spray, while a note on the destruction of imagines on board trains and steamers would have been welcome.

The last chapter is devoted to treatment and is also one of the best in the book. DARLING's research on the action of quinine on gametes is mentioned, as is BASS's view that the destruction or rather eradication of gametes is really due to the action of quinine on the schizonts from which they are derived. The source of origin is destroyed and the already formed gametes eventually die of old age. A new idea is voiced by the author on page 163. He asks if early and efficient treatment in original infections produces a relative immunity to later reinfection. He thinks the rapid destruction of the young parasites may result in the formation of anti-bodies which confer immunity for a certain time. The point is worthy of consideration but it is naturally very difficult to prove or disprove such an hypothesis.

The use of quinine in gelatine capsules for oral administration is advocated while for what the author calls "hypodermatic" administration, he employs ampoules each containing 0·30 gramme of quinine bihydrochloride carbamid, one to three for a dose in pernicious cases. There is little else that calls for special notice. Nothing is said regarding quinine haemoglobinuria, and the question of blackwater fever is completely ignored. Even if one accepts CRAIG's view that blackwater is a specific entity and in no way related to malaria, it is surely advisable with our present knowledge to make some allusion to the condition in a new work on malaria! Another omission, in the section dealing with diagnosis, is the failure to mention the urobilin test which is likely to prove of considerable value in latent and masked malaria where other causes of urobilinuria can be excluded.

Under treatment the use of salvarsan is mentioned only to be condemned. Sodium cacodylate is considered but not recommended. Nothing is said about hectine which finds favour with some French physicians. Picric acid has a section to itself. It is considered worthy of further investigation.

This book has been reviewed in some detail because it is the latest exposition on a most important subject which is rightly attracting greater attention every day. It is a good and a useful book but, as indicated, it is by no means a perfect book and it can be improved in some ways. It is to aid the author in this direction as well as to guide the reader that such criticisms as have been made were penned. We think the work is likely to be deservedly popular, more especially amongst those who have to combat malaria in the Western Hemisphere.

Andrew Balfour.

RUSSELL (Harold), [B.A., F.Z.S., M.B.O.U.]. **The Flea. (Cambridge Manuals No. 74.)**—xii. + 125 pp. With 9 illustrations. 1913. Cambridge, at the University Press. [1*s.* net in cloth; 2*s.* 6*d.* net in leather.]

Within the compass of 121 small pages there is here to be found a very good account of the flea, and a fair historic statement of its pathogenic importance to man, also appendices containing instructions for collecting and preserving fleas, bibliographic landmarks, and a list of British fleas and their hosts. The subject is presented in a way that will interest the general reader and also impress the student; but beyond this it contains a good deal that comes within the purview of the investigator of tropical disease, to whom a knowledge of the structure, post-embryonic development, habits, idiosyncrasies, hosts, and adaptive modifications of this order of insects—such as is here very clearly given—is essential. The chapters on the human flea and other species that commonly attack man—including chigoes—and on the fleas that are commonly found on rats are also of practical interest.

In such a mass of interesting information as is collected in this little book it is inevitable that some statements must be open to criticism; it is therefore necessary to point out—the matter being one of great practical importance—that the statement that "the adult flea can apparently continue for some time to reproduce itself without a meal of any sort" is hardly justified by the most recent observations and experiments, particularly by those of BACOT on *Ceratophyllus fasciatus*.

The author is rather too much addicted to speculation that borders on fine irony: for instance, the proposition that "the absence of eyes" (in bat fleas) "lends colour to the suggestion that fleas which are blind have lost their eyes because they had no need of them" sounds almost like the humour of Dean SWIFT. He is also too much inclined to apologise for the existence of fleas and of "the humble but ridiculous systematist," who, though "the utilitarian despises" him, may "yet become a benefactor of humanity" by studying such ignoble forms of life. Let Mr. Russell work at his fleas with an even mind. As CARLYLE said: "All work, even cotton-spinning, is noble. There is endless hope in work, were it even work at making money"—or experimenting with fleas and lice, so the experiments are well-devised.

A. Alcock.

WALL (F.), [Major, I.M.S., C.M.Z.S.]. **The Poisonous Terrestrial Snakes of our British Indian Dominions (including Ceylon) and how to Recognize them. With Symptoms of Snake Poisoning and Treatment.**—x. + 149 + iv. pp. With 42 text-figs. Third Edition. 1913. Bombay: Published by the Bombay Natural History Society. [Price 3 Rupees.]

The third edition of this little work consists of three parts, the first of which is occupied in the main by diagnoses of the venomous snakes of India, while the second and third parts deal, respectively, with their venom and the treatment of their bite.

In his preliminary classification of snakes, although the author adopts the accepted natural classification, he openly discards the anatomical generalizations upon which that classification is based, and expresses it in his own way in correlative terms of scales. Similarly, in differentiating the venomous from the non-venomous species, he rivets his eye upon the scales and the tail, and pays but scant attention to certain very obvious facts of dentition. It is claimed for this procedure that it is simple; but it is very doubtful whether it is simpler to distinguish, for example, the kraits from certain harmless snakes that have the same curious vertebral scales, by a minute examination of the scales of other regions, when a single look for a poison-fang, or for its mucous sheath, would at once settle the question. On every ground it seems advisable to emphasize the fact that the most mischievous, and in ordinary circumstances the most obvious, possession of a venomous snake is its channelled fang for injecting its venom. Apart however from this general criticism, the specific diagnoses of the venomous snakes are good and have evidently been drawn up with very assiduous care. Great attention has also been bestowed upon the geographical range of each species, though the author is not quite correct in his statement that the banded krait does not occur in North-West India, since it has been found in that part of British Baluchistan which borders on the North-West Frontier Province.

In the second part, which deals with the specific venoms, so far as these have been studied, the toxic constituents of the venom and their exact physiological action are tabulated for each species, and as far as is possible the clinical symptoms also of the bite are described and well illustrated from records of cases. It is a pity that nothing is said of the venom-apparatus, of the manner in which the venom is injected, or of the various circumstances which may modify the virulence of a venom.

As regards treatment of snake-bite, which is very fully discussed in the third part, the author quite rightly and naturally is an academic advocate of suitable antivenine. Where no such antivenine is available and the venom is one that is powerfully haemolytic and haemorrhagic he points to adrenalin, pituitary extract, and calcium salts. He has much to say against, and very little to say in favour of, local treatment by ligature, excision, and the application of permanganate of potash.

A. Alcock.

TROPICAL DISEASES BUREAU LIBRARY.

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*Transactions of the Society of Tropical Medicine & Hygiene (London) ...	1907—	Vol. 1—
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*Revue de Médecine et d'Hygiène Tropicales (Paris)	1904—	Vol. 1—
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Atti della Società per gli Studi della Malaria (Rome)	1907, 1909—	Vols. 8, 10—
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*Archivos de Hygiene e Pathologia Exoticas (Lisbon)	1905—	Vol. 1—
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BOOKS RECEIVED.

REPORTS of the Sleeping Sickness Commission of the Royal Society. No. xiv. 67 pp., with 18 plates, 2 maps, and 4 charts. 8vo. 1913. London : H.M. Stationery Office. [Price 2*s*. 6*d*.]

[Contains papers by (1) Dr. G. D. Hale Carpenter, (2) Dr. H. L. Duke, (3) Capt. A. D. Fraser and Dr. H. L. Duke. (1) and (2) are reviewed in this *Bulletin* at pp. 31 and 41. (3) is a reprint of a paper from the *Proceedings of the Royal Society*, summarised in the *Sleeping Sickness Bulletin*, 1912, vol. 4, pp. 98–101.]

THEOBALD (Fred V.) [M.A., &c.] A Monograph of the Culicidae of the World. Vol. 3. pp. xvii + 359. 8vo. With 17 plates, 1 diagram and 193 text figs. 1903.—Vol. 4. pp. xix. + 639. 8vo. With 16 plates and 297 text figs. 1907.—Vol. 5. pp. xv. + 646. 8vo. With 6 plates and 261 text figs. 1910. London : Printed by order of the Trustees, British Museum (Natural History).

WALL (Major F.) [I.M.S., C.M.Z.S.]. The Poisonous Terrestrial Snakes of our British Indian Dominions (including Ceylon) and how to recognize them. with Symptoms of Snake Poisoning and Treatment.—3rd edit. 4th thousand. 149 pp. Roy. 8vo. With 41 illustrations. 1913. Bombay : Published by the Bombay Natural History Society. [Rupees 3.] [*See* Review, pp. 59–61.]

ZIEMANN (Prof. Hans). Gesundheits-Ratgeber für die Tropen. (Vierte vermehrte und verbesserte Auflage mit 16 Abbildungen.)—63 pp. 8vo. 1913. Berlin : Dietrich Reimer (Ernst Vohsen). [Mk. 1, paper covers]

—— —— Hints to Europeans in Tropical Stations without a Doctor and to Travellers in Warm Climates. Edited and amplified by H. B. Newham, M.R.C.S., L.R.C.P. (Eng.). Translated by P. Falcke.—64 pp. 1910. London : John Bale, Sons, & Danielsson, Ltd.

CRAGG (Captain F. W.) [M.D., I.M.S.]. Studies on the Mouth Parts and Sucking Apparatus of the Blood-Sucking Diptera. No. 4. The Comparative Anatomy of the Proboscis in the Blood-Sucking Muscidae.—*Scientific Memoirs by Officers of the Med. & Sanit. Depts., Govt. of India* (New Series) No. 60.—56 pp. and 5 plates. 1913. Calcutta : Superintendent, Govt. Printing. [Rs. 1–2, or 1*s*. 9*d*.]

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FUNK (Casimir). Die Vitamine, ihre Bedeutung für die Physiologie und Pathologie mit besonderer Berücksichtigung der Avitaminosen : (Beriberi, Skorbut, Pellagra, Rachitis). Anhang : Die Wachstumsubstanz und das Krebsproblem.—viii + 193 pp. With 38 text figs. and 2 plates. 1914. Wiesbaden : Verlag von J. F. Bergmann. [Mk. 8. 60.]

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